

FCC RF Test Report

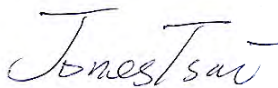
APPLICANT : ZTE CORPORATION
EQUIPMENT : MF97V LTE Ufi
BRAND NAME : ZTE
MODEL NAME : MF97V
FCC ID : SRQ-MF97V
STANDARD : 47 CFR Part 2, 27(F), 27(L)
CLASSIFICATION : PCS Licensed Transmitter (PCB)

The product was received on Dec. 30, 2014 and testing was completed on Jan. 26, 2015. We, SPORTON INTERNATIONAL (KUNSHAN) INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI / TIA / EIA-603-C-2004 and the testing has shown the tested sample to be in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL (KUNSHAN) INC., the test report shall not be reproduced except in full.



Reviewed by: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager



SPORTON INTERNATIONAL (KUNSHAN) INC.
No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1 GENERAL DESCRIPTION	5
1.1 Applicant.....	5
1.2 Manufacturer.....	5
1.3 Product Feature of Equipment Under Test.....	5
1.4 Product Specification subjective to this standard	5
1.5 Modification of EUT	6
1.6 Maximum EIRP Power, Frequency Tolerance, and Emission Designator	6
1.7 Testing Location	7
1.8 Applicable Standards.....	7
2 TEST CONFIGURATION OF EQUIPMENT UNDER TEST	8
2.1 Test Mode.....	8
2.2 Connection Diagram of Test System.....	9
2.3 Support Unit used in test configuration and system	9
2.4 Measurement Results Explanation Example.....	9
3 TEST RESULT.....	10
3.1 Conducted Output Power Measurement	10
3.2 Peak-to-Average Ratio	15
3.3 Effective Radiated Power and Equivalent Isotropic Radiated Power Measurement.....	25
3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement.....	31
3.5 Conducted Band Edge Measurement	49
3.6 Conducted Spurious Emission Measurement	83
3.7 Radiated Spurious Emission Measurement	106
3.8 Frequency Stability Measurement.....	116
4 LIST OF MEASURING EQUIPMENT	119
5 UNCERTAINTY OF EVALUATION	121
APPENDIX A. SETUP PHOTOGRAPHS	



REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG4D3003B	Rev. 01	Initial issue of report	Jan. 28, 2015

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	§2.1046	Conducted Output Power	Reporting Only	PASS	-
3.2	N/A	Peak-to-Average Ratio	Reporting Only	PASS	-
3.3	§27.50(b)(9)	Equivalent Radiated Power (Band 13)	ERP < 3 Watt	PASS	-
	§27.50(d)(4)	Equivalent Isotropic Radiated Power (Band 4)	EIRP < 1Watt		
3.4	§2.1049 §27.53(h)(3)	Occupied Bandwidth & 26dB Bandwidth	Reporting Only	PASS	-
3.5	§2.1051 §27.53(c)(2) §27.53(c)(4) §27.53(h)	Conducted Band Edge Measurement (Band 13) (Band 4)	$< 43 + 10 \log_{10}(P[\text{Watt}])$	PASS	-
3.6	§2.1051 §27.53(c)(2) §27.53(f) §27.53(h)	Conducted Spurious Emission (Band 13) (Band 4)	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	-
3.7	§2.1053 §27.53(c)(2) §27.53(f) §27.53(h)	Radiated Spurious Emission (Band 13) (Band 4)	$< 43 + 10 \log_{10}(P[\text{Watts}])$	PASS	Under limit 22.95 dB at 2334.000 MHz
3.8	§2.1055 §27.54	Frequency Stability Temperature & Voltage	within authorized band	PASS	-



1 General Description

1.1 Applicant

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057,
P.R.China

1.2 Manufacturer

ZTE CORPORATION

ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong, 518057,
P.R.China

1.3 Product Feature of Equipment Under Test

Product Feature	
Equipment	MF97V LTE Ufi
Brand Name	ZTE
Model Name	MF97V
FCC ID	SRQ-MF97V
EUT supports Radios application	LTE/WLAN2.4GHz 802.11b/g/n HT20/HT40 WLAN5GHz 802.11a/n HT20/HT40 Bluetooth v2.1 + EDR/Bluetooth v4.0 LE
HW Version	MF97VV1.0
SW Version	MF97V1.0.0B01
EUT Stage	Identical Prototype

Remark: The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

1.4 Product Specification subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	LTE Band 13 : 779.5 MHz ~ 784.5 MHz LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz
Rx Frequency	LTE Band 13 : 748.5 MHz ~ 753.5 MHz LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz
Bandwidth	LTE Band 13 : 5MHz / 10MHz LTE Band 4 : 1.4MHz / 3MHz / 5MHz / 10MHz / 15MHz / 20MHz
Maximum Output Power to Antenna	LTE Band 13 : 22.62 dBm LTE Band 4 : 23.79 dBm
Antenna Type	PIFA Antenna
Type of Modulation	QPSK / 16QAM

1.5 Modification of EUT

No modifications are made to the EUT during all test items.

1.6 Maximum EIRP Power, Frequency Tolerance, and Emission Designator

FCC Rule	System	Type of Modulation	BW	Emission Designator	Frequency Tolerance	Maximum ERP/EIRP
Part 27F	LTE Band 13	QPSK	5 MHz	4M51G7D	-	0.2570 W
Part 27F	LTE Band 13	16QAM	5 MHz	4M51W7D	-	0.2014 W
Part 27F	LTE Band 13	QPSK	10 MHz	9M13G7D	0.0179 ppm	0.2535 W
Part 27F	LTE Band 13	16QAM	10 MHz	9M07W7D	-	0.1941 W
Part 27L	LTE Band 4	QPSK	1.4 MHz	1M09G7D	-	0.3811 W
Part 27L	LTE Band 4	16QAM	1.4 MHz	1M09W7D	-	0.2999 W
Part 27L	LTE Band 4	QPSK	3 MHz	2M72G7D	-	0.3819 W
Part 27L	LTE Band 4	16QAM	3 MHz	2M72W7D	-	0.2965 W
Part 27L	LTE Band 4	QPSK	5MHz	4M49G7D	-	0.3793 W
Part 27L	LTE Band 4	16QAM	5MHz	4M51W7D	-	0.2844 W
Part 27L	LTE Band 4	QPSK	10MHz	9M05G7D	0.0075 ppm	0.3698 W
Part 27L	LTE Band 4	16QAM	10MHz	8M99W7D	-	0.2897 W
Part 27L	LTE Band 4	QPSK	15MHz	13M4G7D	-	0.3776 W
Part 27L	LTE Band 4	16QAM	15MHz	13M4W7D	-	0.2844 W
Part 27L	LTE Band 4	QPSK	20MHz	18M3G7D	-	0.3802 W
Part 27L	LTE Band 4	16QAM	20MHz	18M2W7D	-	0.2958 W

1.7 Testing Location

Test Site	SPORTON INTERNATIONAL (KUNSHAN) INC.		
Test Site Location	No. 3-2, PingXiang Road, Kunshan, Jiangsu Province, P. R. China TEL: +86-0512-5790-0158 FAX: +86-0512-5790-0958		
Test Site No.	Sporton Site No.		FCC Registration No.
	TH01-KS	03CH01-KS	OTA01-KS 149928

1.8 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- 47 CFR Part 2, 27(F), 27(L)
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.



2 Test Configuration of Equipment Under Test

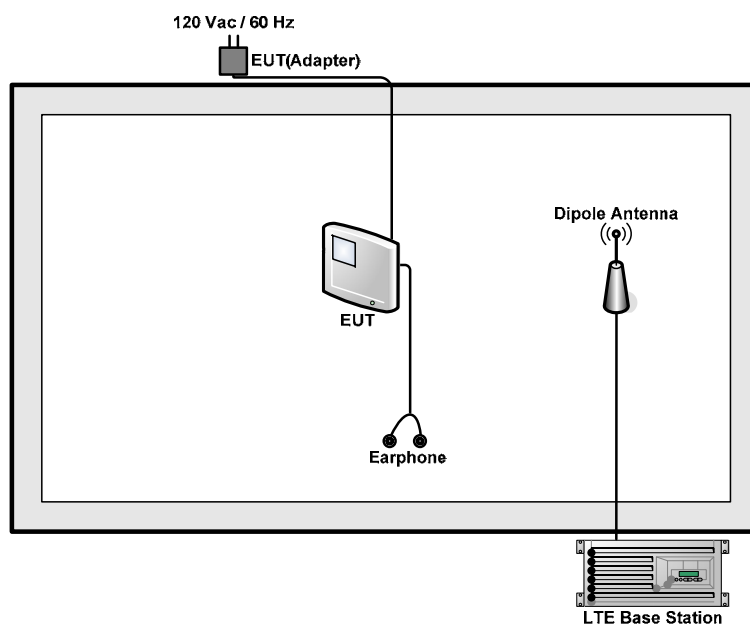
2.1 Test Mode

Antenna port conducted and radiated test items listed below are performed according to KDB 971168 D01 Power Meas. License Digital Systems v02r01 with maximum output power.

Radiated measurements are performed by rotating the EUT in three different orthogonal test planes to find the maximum emission.

Test Items	Band	Bandwidth (MHz)						Modulation		RB #			Test Channel		
		1.4	3	5	10	15	20	QPSK	16QAM	1	Half	Full	L	M	H
Max. Output Power	13	-	-	v	v	-	-	v	v	v	v	v	v	v	v
	4	v	v	v	v	v	v	v	v	v	v	v	v	v	v
Peak-to-Average Ratio	13	-	-		v	-	-	v	v	v		v		v	
	4						v	v	v	v		v	v	v	v
26dB and 99% Bandwidth	13	-	-	v	v	-	-	v	v			v		v	
	4	v	v	v	v	v	v	v	v			v		v	
Conducted Band Edge	13	-	-	v	v	-	-	v	v	v		v		v	
	4	v	v	v	v	v	v	v	v	v		v	v		v
Conducted Spurious Emission	13	-	-	v	v	-	-	v	v	v			v	v	v
	4	v	v	v	v	v	v	v	v	v			v	v	v
Frequency Stability	13	-	-		v	-	-	v				v		v	
	4				v			v				v		v	
E.I.R.P.	13	-	-	v	v	-	-	v	v	v			v	v	v
	4	v	v	v	v	v	v	v	v	v			v	v	v
Radiated Spurious Emission	13	-	-	v	v	-	-	v		v				v	
	4	v	v	v	v	v	v	v		v				v	
Note	- The mark "v" means that this configuration is chosen for testing - The mark "-" means that this bandwidth is not supported. - The device is investigated from 30MHz to 10 times of fundamental signal for radiated spurious emission test under different RB size/offset and modulations in exploratory test. Subsequently, only the worst case emissions are reported.														

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	DC Power Supply	GWINSTEK	GPS-3030D	N/A	N/A	Unshielded, 1.8 m
3.	Earphone	Lenovo	SH100	N/A	Unshielded, 1.2m	Unshielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss.

Offset = RF cable loss.

Following shows an offset computation example with cable loss 5 dB.

Example :

Offset(dB) = RF cable loss(dB) = 5 (dB)

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

A system simulator was used to establish communication with the EUT. Its parameters were set to force the EUT transmitting at maximum output power. The measured power in the radio frequency on the transmitter output terminals shall be reported.

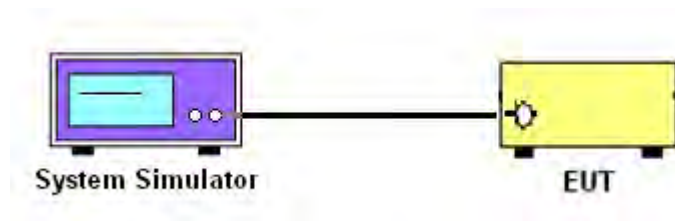
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedures

1. The transmitter output port was connected to the system simulator.
2. Set EUT at maximum power through the system simulator.
3. Select lowest, middle, and highest channels for each band and different modulation.
4. Measure and record the power level from the system simulator.

3.1.4 Test Setup





3.1.5 Test Result of Conducted Output Power

<LTE Band 13 Conducted Power>

BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel					23230	
Frequency (MHz)					782	
10	QPSK	1	0		22.62	
10	QPSK	1	24		22.53	
10	QPSK	1	49		22.50	
10	QPSK	25	0		21.86	
10	QPSK	25	12		21.85	
10	QPSK	25	24		21.69	
10	QPSK	50	0		21.74	
10	16QAM	1	0		22.60	
10	16QAM	1	24		22.51	
10	16QAM	1	49		22.49	
10	16QAM	25	0		21.43	
10	16QAM	25	12		21.34	
10	16QAM	25	24		21.25	
10	16QAM	50	0		21.18	
Channel				23205	23230	23255
Frequency (MHz)				779.5	782	784.5
5	QPSK	1	0	22.57	22.59	22.58
5	QPSK	1	12	22.47	22.52	22.42
5	QPSK	1	24	22.53	22.58	22.48
5	QPSK	12	0	21.66	21.67	21.52
5	QPSK	12	6	21.59	21.62	21.56
5	QPSK	12	11	21.57	21.60	21.62
5	QPSK	25	0	21.66	21.64	21.61
5	16QAM	1	0	21.88	21.76	21.98
5	16QAM	1	12	21.58	21.73	21.39
5	16QAM	1	24	21.59	21.69	21.76
5	16QAM	12	0	21.25	21.34	21.06
5	16QAM	12	6	21.14	21.32	21.15
5	16QAM	12	11	21.25	21.25	21.19
5	16QAM	25	0	21.11	21.27	21.22

**<LTE Band 4 Conducted Power>**

BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20050	20175	20300
Frequency (MHz)				1720	1732.5	1745
20	QPSK	1	0	23.60	23.79	23.73
20	QPSK	1	49	23.51	23.59	23.64
20	QPSK	1	99	23.36	23.55	23.52
20	QPSK	50	0	22.71	22.83	22.78
20	QPSK	50	24	22.67	22.65	22.71
20	QPSK	50	49	22.63	22.72	22.68
20	QPSK	100	0	22.60	22.69	22.59
20	16QAM	1	0	22.67	22.72	22.92
20	16QAM	1	49	22.42	22.23	22.54
20	16QAM	1	99	22.48	22.66	22.21
20	16QAM	50	0	21.63	21.67	21.73
20	16QAM	50	24	21.55	21.62	21.56
20	16QAM	50	49	21.61	21.62	21.72
20	16QAM	100	0	21.65	21.64	21.58
Channel				20025	20175	20325
Frequency (MHz)				1717.5	1732.5	1747.5
15	QPSK	1	0	23.58	23.64	23.69
15	QPSK	1	37	23.57	23.59	23.62
15	QPSK	1	74	23.46	23.61	23.48
15	QPSK	36	0	22.69	22.62	22.65
15	QPSK	36	18	22.66	22.61	22.63
15	QPSK	36	37	22.56	22.59	22.56
15	QPSK	75	0	22.65	22.70	22.75
15	16QAM	1	0	22.44	22.84	22.62
15	16QAM	1	37	22.83	22.78	22.26
15	16QAM	1	74	22.27	22.87	22.47
15	16QAM	36	0	21.58	21.60	21.65
15	16QAM	36	18	21.69	21.66	21.65
15	16QAM	36	37	21.45	21.53	21.53
15	16QAM	75	0	21.52	21.63	21.78



BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20000	20175	20350
Frequency (MHz)				1715	1732.5	1750
10	QPSK	1	0	23.48	23.51	23.58
10	QPSK	1	24	23.67	23.48	23.61
10	QPSK	1	49	23.53	23.57	23.55
10	QPSK	25	0	22.62	22.63	22.68
10	QPSK	25	12	22.69	22.64	22.66
10	QPSK	25	24	22.58	22.57	22.58
10	QPSK	50	0	22.70	22.63	22.77
10	16QAM	1	0	22.72	22.52	22.30
10	16QAM	1	24	22.18	22.20	22.47
10	16QAM	1	49	22.56	22.38	22.42
10	16QAM	25	0	21.60	21.70	21.71
10	16QAM	25	12	21.60	21.58	21.63
10	16QAM	25	24	21.57	21.65	21.58
10	16QAM	50	0	21.61	21.68	21.68
Channel				19975	20175	20375
Frequency (MHz)				1712.5	1732.5	1752.5
5	QPSK	1	0	23.55	23.58	23.68
5	QPSK	1	12	23.51	23.49	23.49
5	QPSK	1	24	23.56	23.51	23.60
5	QPSK	12	0	22.57	22.60	22.58
5	QPSK	12	6	22.65	22.66	22.61
5	QPSK	12	11	22.58	22.58	22.55
5	QPSK	25	0	22.59	22.69	22.61
5	16QAM	1	0	22.35	22.77	22.62
5	16QAM	1	12	22.69	22.54	22.78
5	16QAM	1	24	22.33	22.35	22.21
5	16QAM	12	0	21.63	21.66	21.62
5	16QAM	12	6	21.56	21.71	21.58
5	16QAM	12	11	21.50	21.64	21.54
5	16QAM	25	0	21.61	21.51	21.55



BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				19965	20175	20385
Frequency (MHz)				1711.5	1732.5	1753.5
3	QPSK	1	0	23.49	23.66	23.53
3	QPSK	1	7	23.53	23.54	23.60
3	QPSK	1	14	23.49	23.54	23.63
3	QPSK	8	0	22.56	22.61	22.64
3	QPSK	8	4	22.57	22.63	22.57
3	QPSK	8	7	22.56	22.69	22.68
3	QPSK	15	0	22.51	22.59	22.66
3	16QAM	1	0	22.49	22.20	22.27
3	16QAM	1	7	22.21	22.68	22.40
3	16QAM	1	14	22.44	22.32	22.60
3	16QAM	8	0	21.47	21.65	21.69
3	16QAM	8	4	21.50	21.59	21.60
3	16QAM	8	7	21.67	21.71	21.67
3	16QAM	15	0	21.55	21.59	21.56
Channel				19957	20175	20393
Frequency (MHz)				1710.7	1732.5	1754.3
1.4	QPSK	1	0	23.48	23.56	23.60
1.4	QPSK	1	2	23.44	23.61	23.57
1.4	QPSK	1	5	23.48	23.59	23.65
1.4	QPSK	3	0	23.46	23.62	23.64
1.4	QPSK	3	1	23.52	23.63	23.56
1.4	QPSK	3	2	23.45	23.64	23.57
1.4	QPSK	6	0	22.60	22.67	22.66
1.4	16QAM	1	0	22.31	22.28	22.44
1.4	16QAM	1	2	22.45	22.96	22.72
1.4	16QAM	1	5	22.69	22.58	22.79
1.4	16QAM	3	0	22.46	22.62	22.42
1.4	16QAM	3	1	22.52	22.37	22.52
1.4	16QAM	3	2	22.53	22.55	22.63
1.4	16QAM	6	0	21.32	21.60	21.57

Note: maximum average power for LTE.

3.2 Peak-to-Average Ratio

3.2.1 Description of the PAR Measurement

Power Complementary Cumulative Distribution Function (CCDF) curves provide a means for characterizing the power peaks of a digitally modulated signal on a statistical basis. A CCDF curve depicts the probability of the peak signal amplitude exceeding the average power level. Most contemporary measurement instrumentation include the capability to produce CCDF curves for an input signal provided that the instrument's resolution bandwidth can be set wide enough to accommodate the entire input signal bandwidth. In measuring transmissions in this band using an average power technique, the peak-to-average ratio (PAR) of the transmission may not exceed 13 dB.

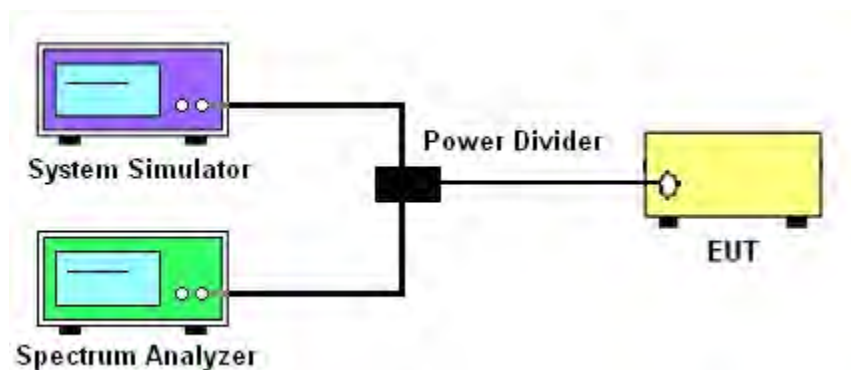
3.2.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

1. The EUT was connected to spectrum and system simulator via a power divider.
2. Set the CCDF (Complementary Cumulative Distribution Function) option in spectrum analyzer.
3. The highest RF powers were measured and recorded the maximum PAPR level associated with a probability of 0.1 %.
4. Record the deviation as Peak to Average Ratio.

3.2.4 Test Setup



3.2.5 Test Result of Peak-to-Average Ratio

LTE Band 13						
BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel					23230	
Frequency (MHz)					782	
10	QPSK	1	0		4.38	
10	QPSK	50	0		5.28	
10	16QAM	1	0		5.74	
10	16QAM	50	0		6.03	

LTE Band 4						
BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel				20050	20175	20300
Frequency (MHz)				1720	1732.5	1745
20	QPSK	1	0	4.90	4.93	5.13
20	QPSK	100	0	5.39	5.22	5.36
20	16QAM	1	0	6.38	6.38	6.41
20	16QAM	100	0	6.38	6.20	6.32



3.2.6 Peak to Average Power Ratio

Peak-to-Average Ratio on LTE Band 13

10MHz / QPSK in Ch. 23230 (1RB Size)



Date: 6 JAN 2015 14:13:45

Peak-to-Average Ratio on LTE Band 13

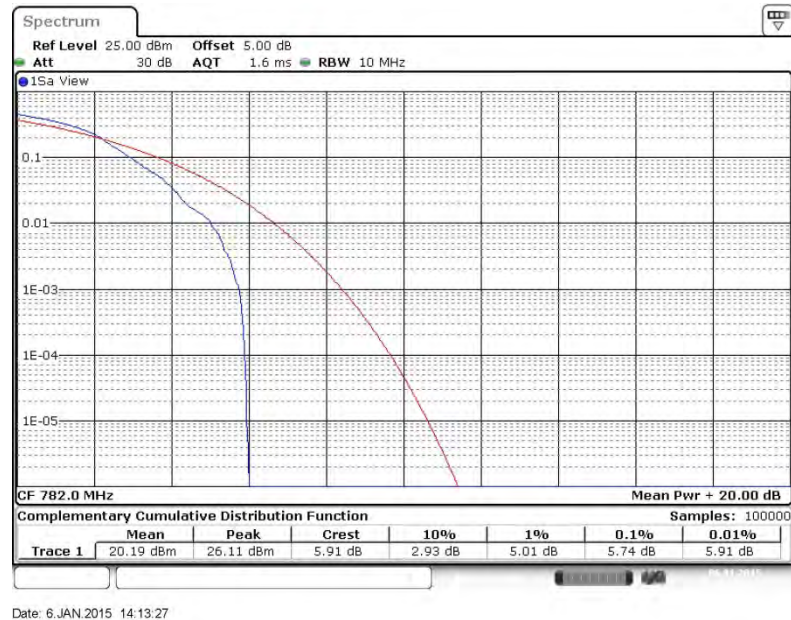
10MHz / QPSK in Ch. 23230 (50RB Size)



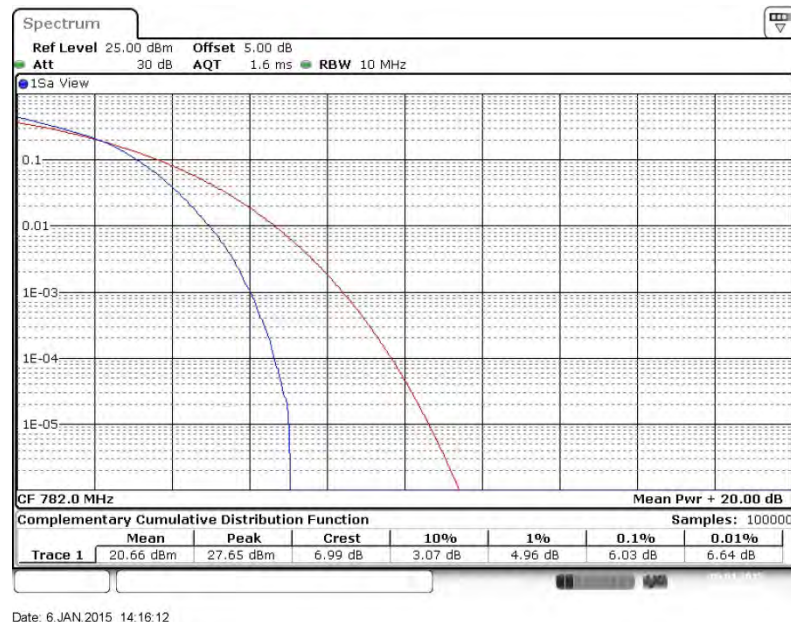
Date: 6 JAN 2015 14:15:37



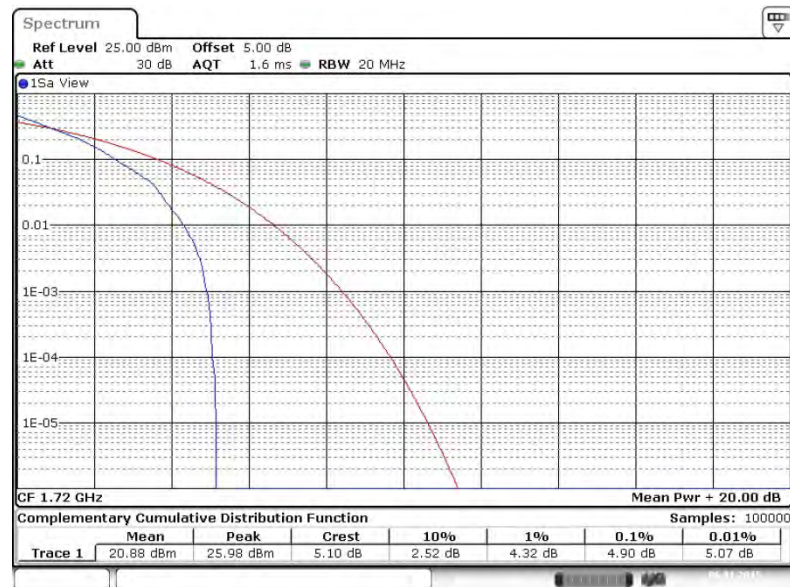
Peak-to-Average Ratio on LTE Band 13
10MHz / 16QAM in Ch. 23230 (1RB Size)



Peak-to-Average Ratio on LTE Band 13
10MHz / 16QAM in Ch. 23230 (50RB Size)



Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20050 (1RB Size)



Date: 6 JAN 2015 13:08:05

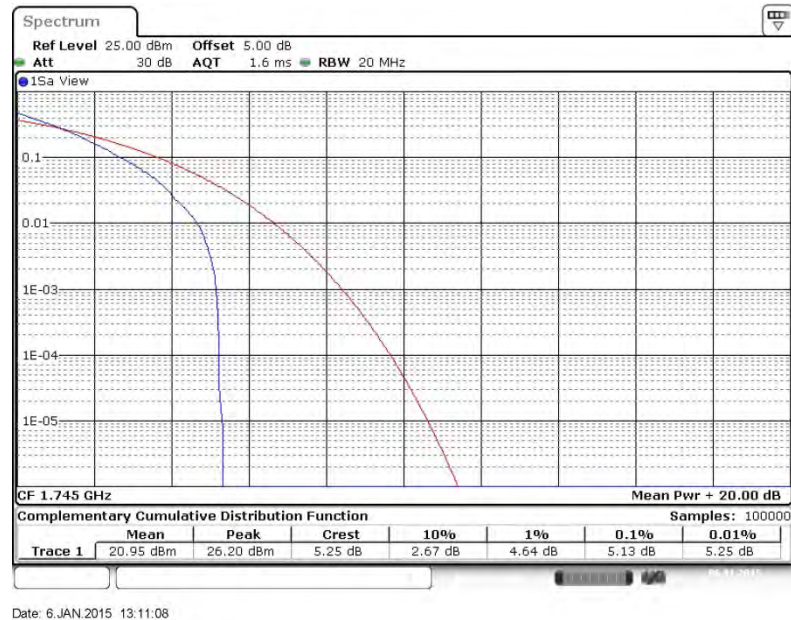
Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20175 (1RB Size)



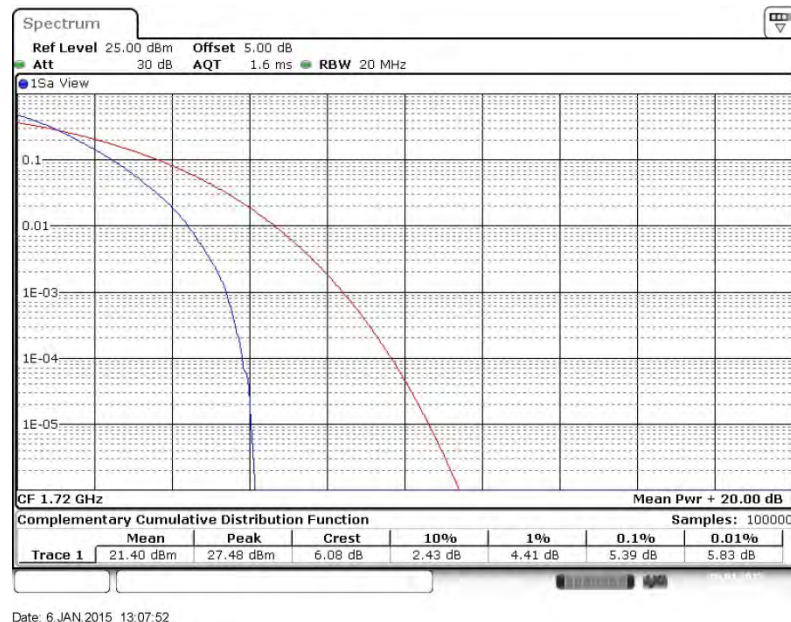
Date: 6 JAN 2015 13:09:40



Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20300 (1RB Size)

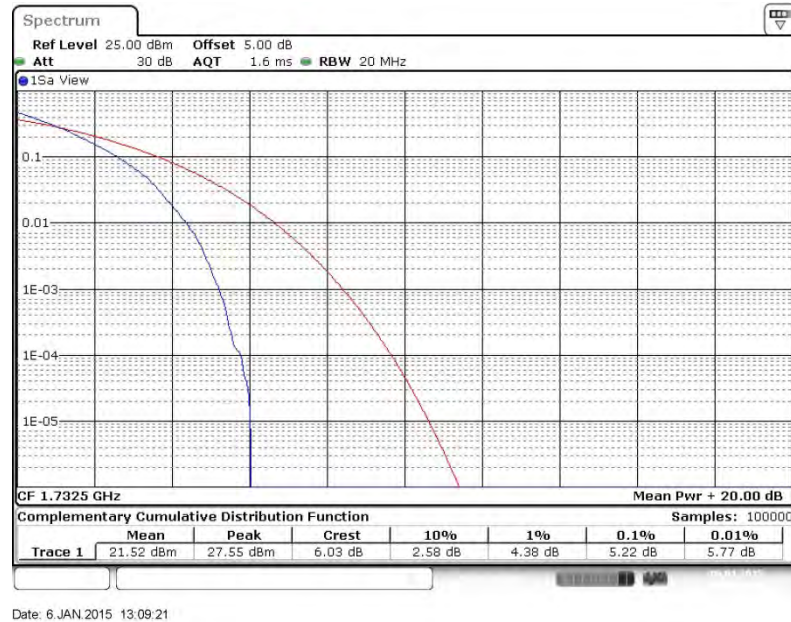


Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20050 (100RB Size)

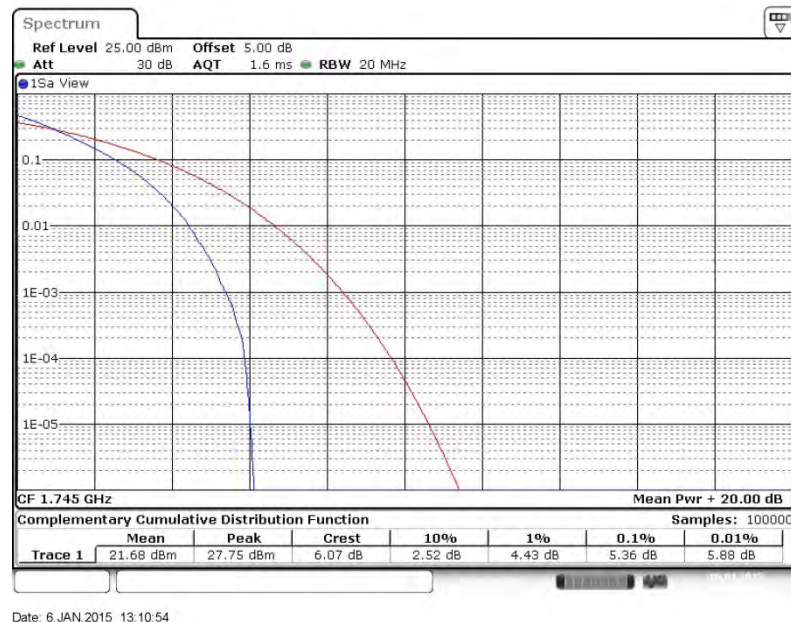




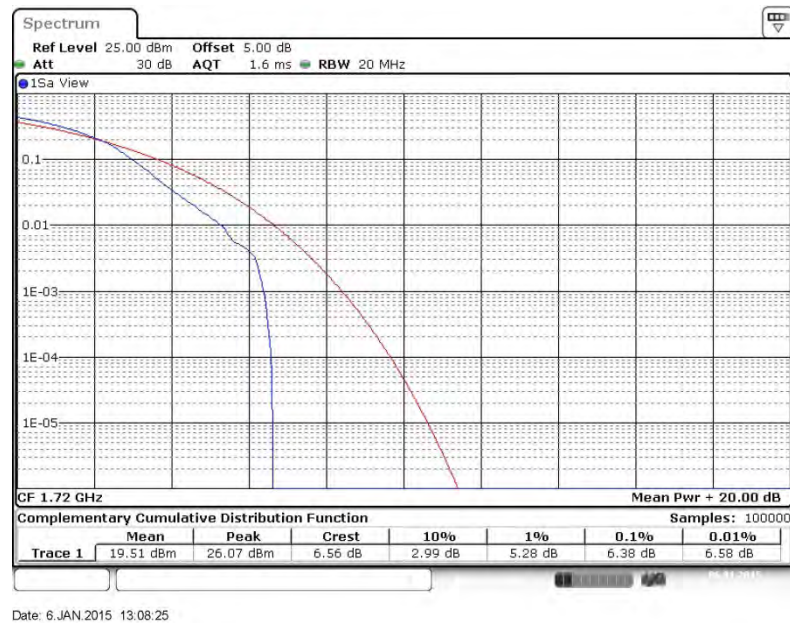
Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20175 (100RB Size)



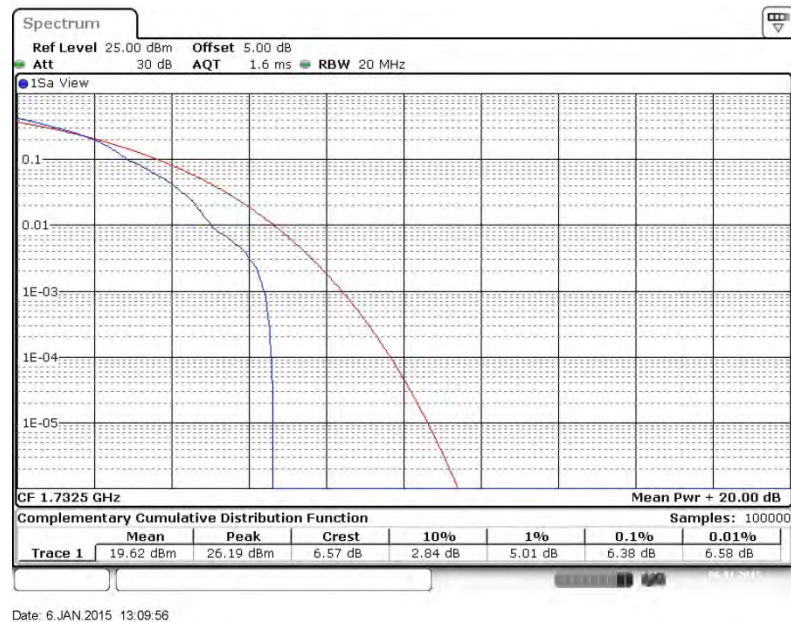
Peak-to-Average Ratio on LTE Band 4
20MHz / QPSK in Ch. 20300 (100RB Size)



Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20050 (1RB Size)

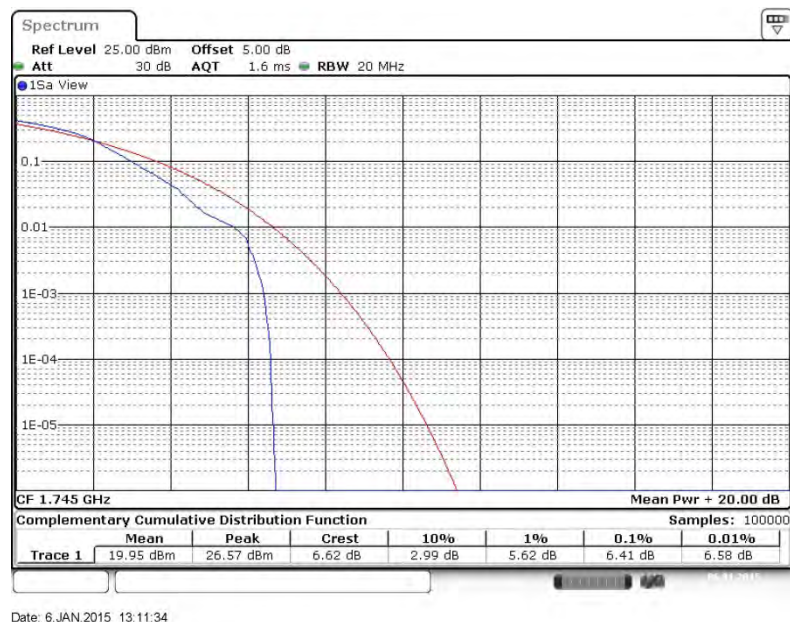


Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20175 (1RB Size)

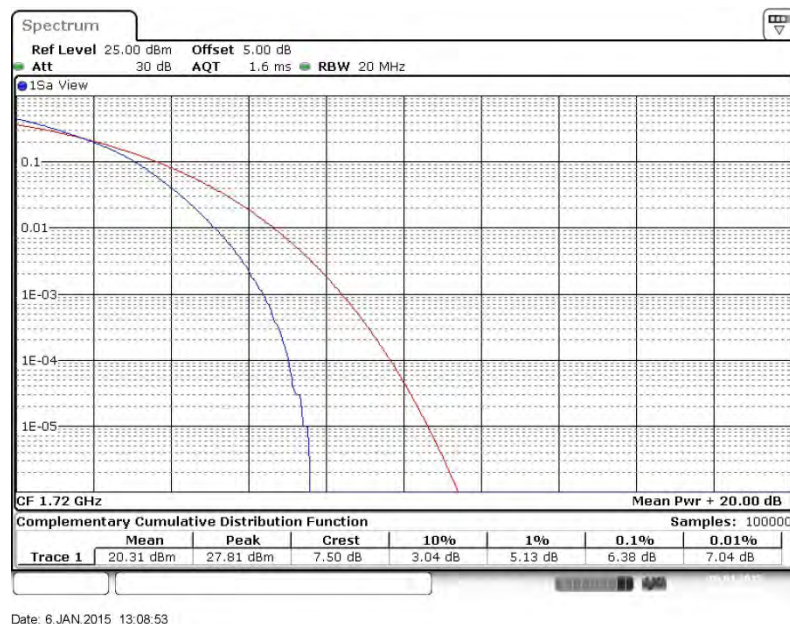




Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20300 (1RB Size)

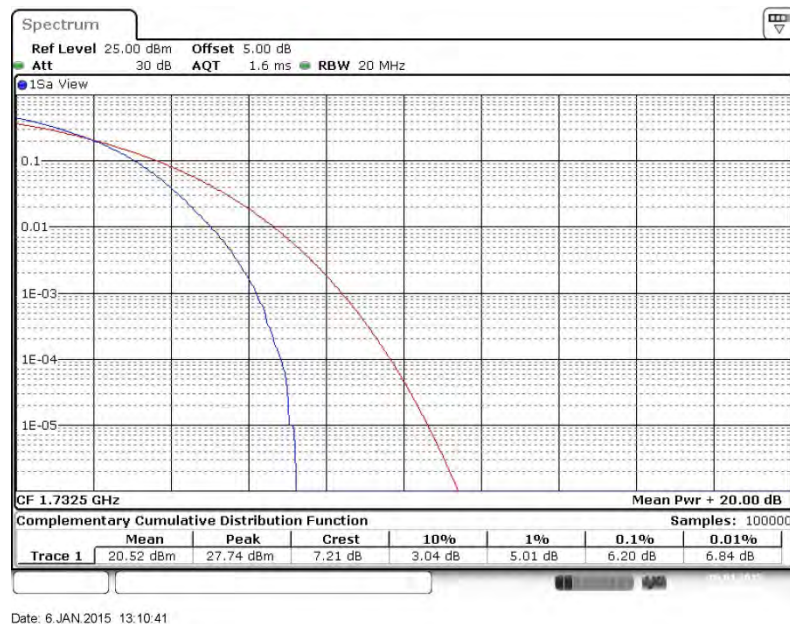


Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20050 (100RB Size)

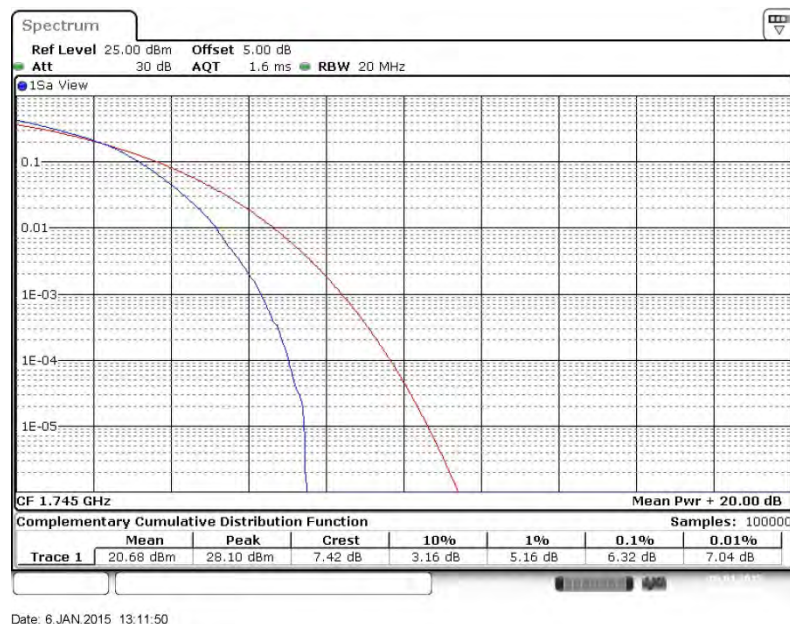




Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20175 (100RB Size)



Peak-to-Average Ratio on LTE Band 4
20MHz / 16QAM in Ch. 20300 (100RB Size)



3.3 Effective Radiated Power and Equivalent Isotropic Radiated Power Measurement

3.3.1 Description of the ERP/EIRP Measurement

Effective radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. Mobile and portable (hand-held) stations operating are limited to average ERP of 3 watts with LTE band 13.

Equivalent isotropic radiated power output measurements by substitution method according to ANSI / TIA / EIA-603-C-2004, and the spectrum analyzer configuration follows KDB 971168 D01 Power Meas. License Digital Systems v02r01. Mobile and portable (hand-held) stations operating are limited to average EIRP of 1 watt with LTE band 4.

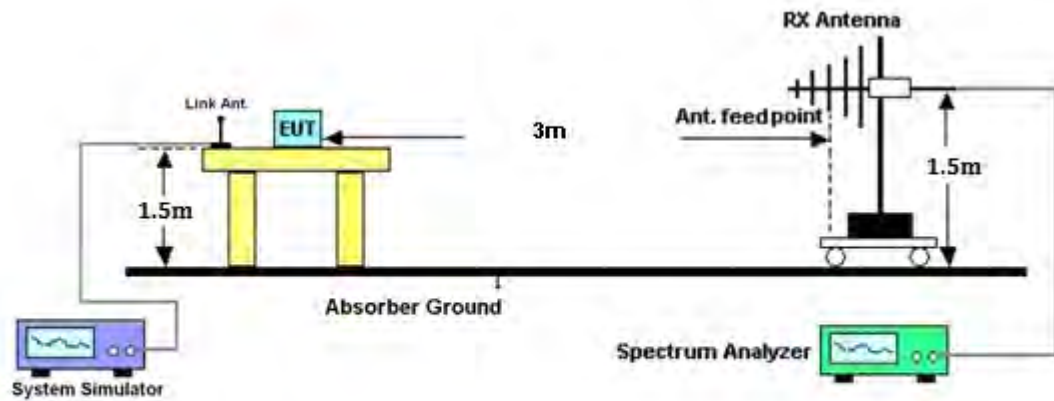
3.3.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.3.3 Test Procedures

1. The EUT was placed on a turntable with 1.5 meter height in a fully anechoic chamber.
2. The EUT was set at 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The radiated emission at the fundamental frequency was measured at 3 m with a test antenna and a spectrum analyzer which used a channel power option across EUT's signal bandwidth per section 4.0 of KDB 971168 D01.
4. The table was rotated 360 degrees to determine the position of the highest radiated power.
5. The height of the receiving antenna is adjusted to look for the maximum EIRP.
6. Taking the record of maximum EIRP.
7. A dipole antenna was substituted in place of the EUT and was driven by a signal generator.
8. The conducted power at the terminal of the dipole antenna is measured.
9. Repeat step 3 to step 5 to get the maximum ERP/EIRP of the substitution antenna.
10. $EIRP = P_s + E_t - E_s + G_s = P_s + R_t - R_s + G_s$
 P_s (dBm) : Input power to substitution antenna.
 G_s (dBi or dBd) : Substitution antenna Gain.
 $E_t = R_t + AF$
 $E_s = R_s + AF$
 AF (dB/m) : Receive antenna factor
 R_t : The highest received signal in spectrum analyzer for EUT.
 R_s : The highest received signal in spectrum analyzer for substitution antenna.

3.3.4 Test Setup



3.3.5 Test Result of ERP/EIRP

LTE Band 13 Radiated Power ERP								
LTE Band	Channel BW (MHz)	Modulation	RB Configuration		Freq. (MHz)	ERP (dBm)	ERP (W)	H/V
			RB Size	RB Offset				
13	5	QPSK	1	0	779.5	22.96	0.1977	H
13	5	QPSK	1	0	782	22.64	0.1837	H
13	5	QPSK	1	0	748.5	22.61	0.1824	H
13	5	QPSK	1	0	779.5	23.92	0.2466	V
13	5	QPSK	1	0	782	24.10	0.2570	V
13	5	QPSK	1	0	748.5	23.88	0.2443	V
13	5	16QAM	1	0	779.5	22.11	0.1626	H
13	5	16QAM	1	0	782	21.95	0.1567	H
13	5	16QAM	1	0	748.5	21.77	0.1503	H
13	5	16QAM	1	0	779.5	22.96	0.1977	V
13	5	16QAM	1	0	782	23.04	0.2014	V
13	5	16QAM	1	0	748.5	22.76	0.1888	V
13	10	QPSK	1	0	782	22.60	0.1820	H
13	10	QPSK	1	0	782	24.04	0.2535	V
13	10	16QAM	1	0	782	21.94	0.1563	H
13	10	16QAM	1	0	782	22.88	0.1941	V



LTE Band 4 Radiated Power EIRP								
LTE Band	Channel BW (MHz)	Modulation	RB Configuration		Freq. (MHz)	EIRP (dBm)	EIRP (W)	H/V
			RB Size	RB Offset				
4	1.4	QPSK	3	1	1710.7	25.81	0.3811	H
4	1.4	QPSK	3	2	1732.5	25.11	0.3243	H
4	1.4	QPSK	1	5	1754.3	24.68	0.2938	H
4	1.4	QPSK	3	1	1710.7	25.72	0.3733	V
4	1.4	QPSK	3	2	1732.5	25.41	0.3475	V
4	1.4	QPSK	1	5	1754.3	25.49	0.3540	V
4	1.4	16QAM	1	5	1710.7	24.77	0.2999	H
4	1.4	16QAM	1	2	1732.5	24.10	0.2570	H
4	1.4	16QAM	1	5	1754.3	23.68	0.2333	H
4	1.4	16QAM	1	5	1710.7	24.63	0.2904	V
4	1.4	16QAM	1	2	1732.5	24.45	0.2786	V
4	1.4	16QAM	1	5	1754.3	24.33	0.2710	V
4	3	QPSK	1	7	1711.5	25.82	0.3819	H
4	3	QPSK	1	0	1732.5	25.20	0.3311	H
4	3	QPSK	1	14	1753.5	24.77	0.2999	H
4	3	QPSK	1	7	1711.5	25.74	0.3750	V
4	3	QPSK	1	0	1732.5	25.53	0.3573	V
4	3	QPSK	1	14	1753.5	25.47	0.3524	V
4	3	16QAM	1	0	1711.5	24.72	0.2965	H
4	3	16QAM	1	7	1732.5	23.97	0.2495	H
4	3	16QAM	1	14	1753.5	23.59	0.2286	H
4	3	16QAM	1	0	1711.5	24.61	0.2891	V
4	3	16QAM	1	7	1732.5	24.31	0.2698	V
4	3	16QAM	1	14	1753.5	24.24	0.2655	V



LTE Band 4 Radiated Power EIRP								
LTE Band	Channel BW (MHz)	Modulation	RB Configuration		Freq. (MHz)	EIRP (dBm)	EIRP (W)	H/V
			RB Size	RB Offset				
4	5	QPSK	1	24	1712.5	25.79	0.3793	H
4	5	QPSK	1	0	1732.5	25.22	0.3327	H
4	5	QPSK	1	0	1752.5	24.92	0.3105	H
4	5	QPSK	1	24	1712.5	25.65	0.3673	V
4	5	QPSK	1	0	1732.5	25.49	0.3540	V
4	5	QPSK	1	0	1752.5	25.58	0.3614	V
4	5	16QAM	1	12	1712.5	24.54	0.2844	H
4	5	16QAM	1	0	1732.5	23.90	0.2455	H
4	5	16QAM	1	12	1752.5	23.58	0.2280	H
4	5	16QAM	1	12	1712.5	24.38	0.2742	V
4	5	16QAM	1	0	1732.5	24.22	0.2642	V
4	5	16QAM	1	12	1752.5	24.15	0.2600	V
4	10	QPSK	1	24	1715	25.68	0.3698	H
4	10	QPSK	1	49	1732.5	25.10	0.3236	H
4	10	QPSK	1	24	1750	24.77	0.2999	H
4	10	QPSK	1	24	1715	25.54	0.3581	V
4	10	QPSK	1	49	1732.5	25.65	0.3673	V
4	10	QPSK	1	24	1750	25.46	0.3516	V
4	10	16QAM	1	0	1715	24.62	0.2897	H
4	10	16QAM	1	0	1732.5	24.08	0.2559	H
4	10	16QAM	1	24	1750	23.68	0.2333	H
4	10	16QAM	1	0	1715	24.51	0.2825	V
4	10	16QAM	1	0	1732.5	24.36	0.2729	V
4	10	16QAM	1	24	1750	24.38	0.2742	V



LTE Band 4 Radiated Power EIRP								
LTE Band	Channel BW (MHz)	Modulation	RB Configuration		Freq. (MHz)	EIRP (dBm)	EIRP (W)	H/V
			RB Size	RB Offset				
4	15	QPSK	1	0	1717.5	25.77	0.3776	H
4	15	QPSK	1	0	1732.5	25.32	0.3404	H
4	15	QPSK	1	0	1747.5	24.90	0.3090	H
4	15	QPSK	1	0	1717.5	25.64	0.3664	V
4	15	QPSK	1	0	1732.5	25.55	0.3589	V
4	15	QPSK	1	0	1747.5	25.58	0.3614	V
4	15	16QAM	1	37	1717.5	24.40	0.2754	H
4	15	16QAM	1	74	1732.5	23.81	0.2404	H
4	15	16QAM	1	0	1747.5	23.76	0.2377	H
4	15	16QAM	1	37	1717.5	24.54	0.2844	V
4	15	16QAM	1	74	1732.5	24.49	0.2812	V
4	15	16QAM	1	0	1747.5	24.53	0.2838	V
4	20	QPSK	1	0	1720	25.80	0.3802	H
4	20	QPSK	1	0	1732.5	25.36	0.3436	H
4	20	QPSK	1	0	1745	25.19	0.3304	H
4	20	QPSK	1	0	1720	25.65	0.3673	V
4	20	QPSK	1	0	1732.5	25.43	0.3491	V
4	20	QPSK	1	0	1745	25.72	0.3733	V
4	20	16QAM	1	0	1720	24.71	0.2958	H
4	20	16QAM	1	0	1732.5	24.19	0.2624	H
4	20	16QAM	1	0	1745	24.03	0.2529	H
4	20	16QAM	1	0	1720	24.54	0.2844	V
4	20	16QAM	1	0	1732.5	24.35	0.2723	V
4	20	16QAM	1	0	1745	24.58	0.2871	V

3.4 99% Occupied Bandwidth and 26dB Bandwidth Measurement

3.4.1 Description of 99% Occupied Bandwidth and 26dB Bandwidth Measurement

The occupied bandwidth is the width of a frequency band such that, below the lower and above the upper frequency limits, the mean powers emitted are each equal to a specified percentage 0.5% of the total mean transmitted power.

The 26 dB emission bandwidth is defined as the frequency range between two points, one above and one below the carrier frequency, at which the spectral density of the emission is attenuated 26 dB below the maximum in-band spectral density of the modulated signal. Spectral density (power per unit bandwidth) is to be measured with a detector of resolution bandwidth equal to approximately 1.0% of the emission bandwidth.

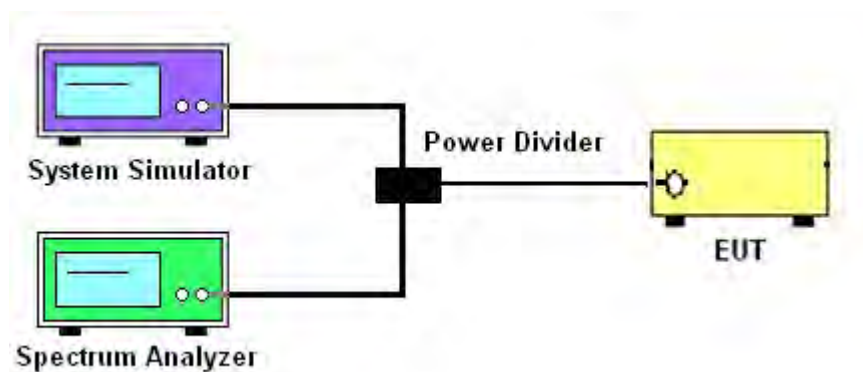
3.4.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.4.3 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The 26dB and 99% occupied bandwidth (BW) of the middle channel for the highest RF power with full RB sizes were measured.

3.4.4 Test Setup



3.4.5 Test Result of 99% Occupied Bandwidth and 26dB Bandwidth

Modes	LTE Band 13			
BW / Mod.	5MHz / QPSK	5MHz / 16QAM	10MHz / QPSK	10MHz / 16QAM
99% OBW (MHz)	4.505	4.505	9.131	9.071
26dB BW (MHz)	5.045	5.045	10.090	9.970

Modes	LTE Band 4			
BW / Mod.	1.4MHz / QPSK	1.4MHz / 16QAM	3MHz / QPSK	3MHz / 16QAM
99% OBW (MHz)	1.094	1.094	2.721	2.721
26dB BW (MHz)	1.290	1.290	3.033	3.045
BW / Mod.	5MHz / QPSK	5MHz / 16QAM	10MHz / QPSK	10MHz / 16QAM
99% OBW (MHz)	4.486	4.505	9.051	8.991
26dB BW (MHz)	5.035	5.015	9.870	9.950
BW / Mod.	15MHz / QPSK	15MHz / 16QAM	20MHz / QPSK	20MHz / 16QAM
99% OBW (MHz)	13.397	13.427	18.302	18.222
26dB BW (MHz)	14.476	14.655	20.420	20.220

Note:

The maximum RB configurations of the 99% Occupied Bandwidth and 26dB Bandwidth summary as below:

BW1.4MHz RB setting : RB Size 6, RB offset 0

BW3.0MHz RB setting : RB Size 15, RB offset 0

BW5.0MHz RB setting : RB Size 25, RB offset 0

BW10MHz RB setting : RB Size 50, RB offset 0

BW15MHz RB setting : RB Size 75, RB offset 0

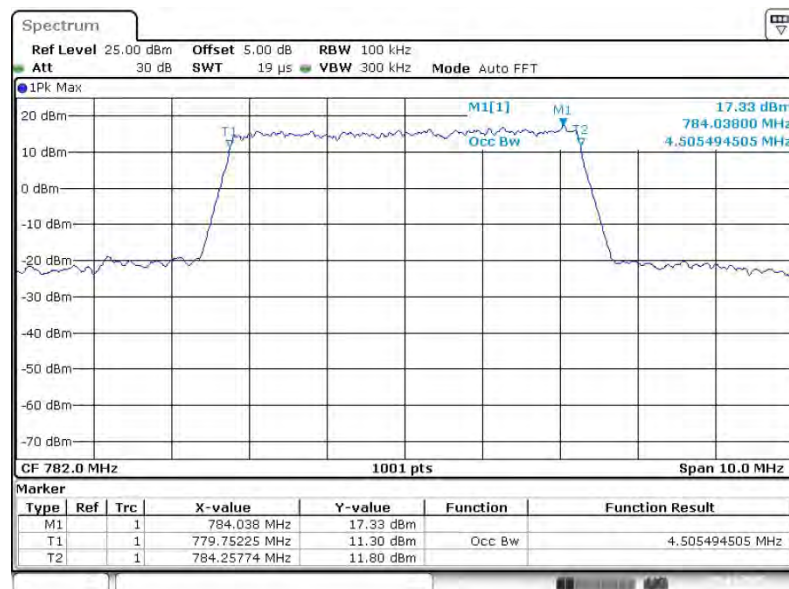
BW20MHz RB setting : RB Size 100, RB offset 0



3.4.6 Test Result (Plots) of 99% Occupied Bandwidth and 26dB Bandwidth

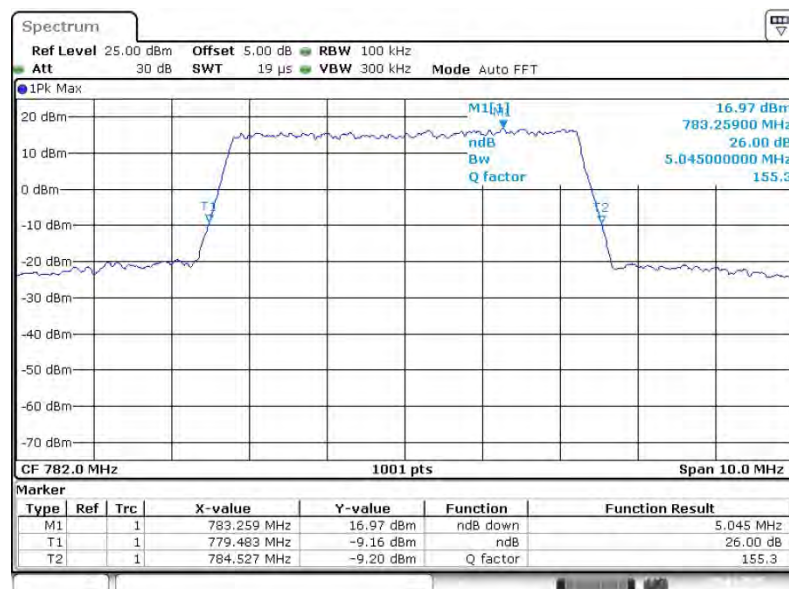
Band :	LTE Band 13	BW / Mod. :	5MHz / QPSK
--------	-------------	-------------	-------------

99% Occupied Bandwidth Plot on Channel 23230

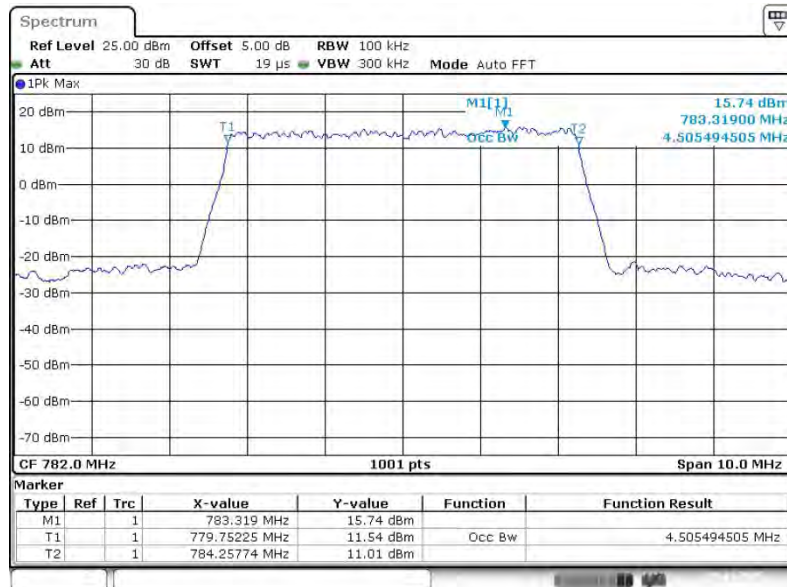


Date: 6 JAN 2015 13:51:42

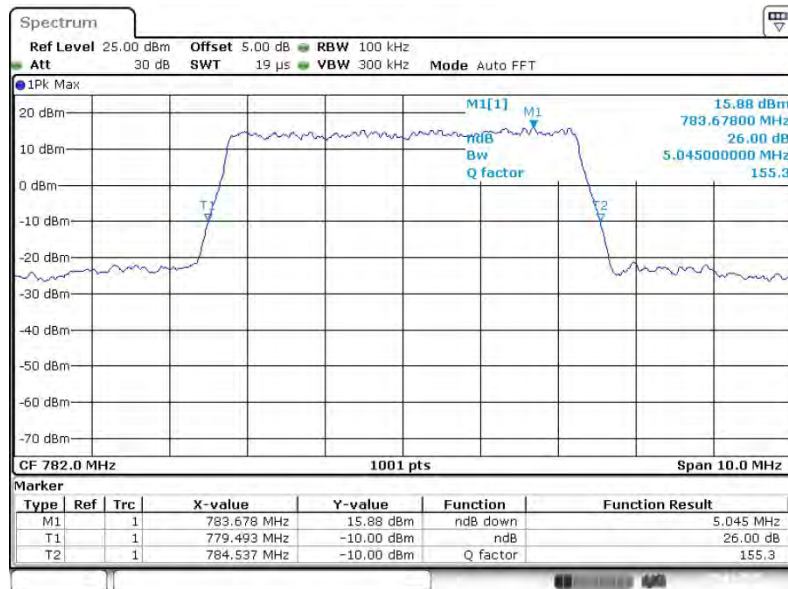
26dB Bandwidth Plot on Channel 23230



Date: 6 JAN 2015 13:52:04

**Band :** LTE Band 13**BW / Mod. :** 5MHz / 16QAM**99% Occupied Bandwidth Plot on Channel 23230**

Date: 6 JAN 2015 13:51:52

26dB Bandwidth Plot on Channel 23230

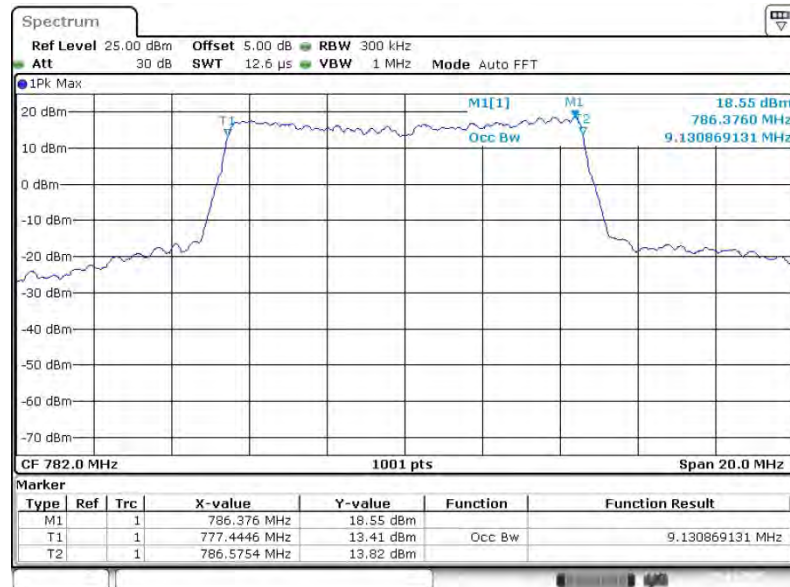
Date: 6 JAN 2015 13:52:16



Band : LTE Band 13

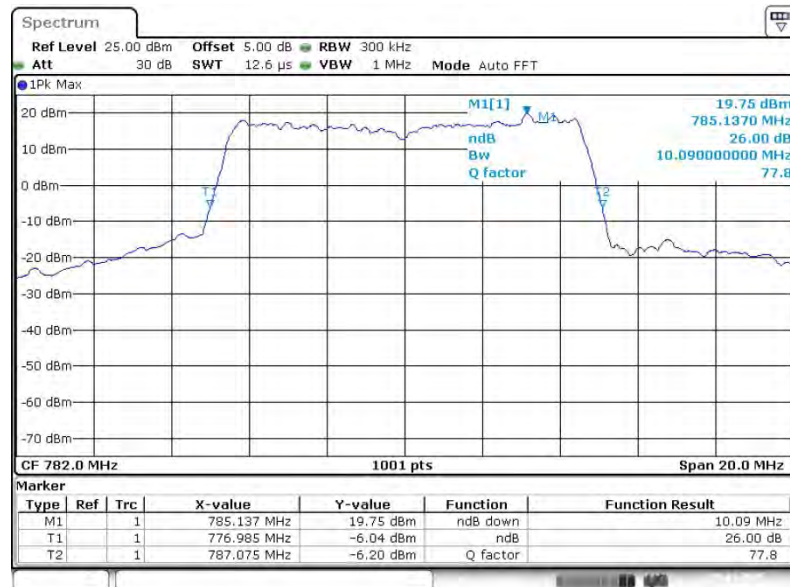
BW / Mod. : 10MHz / QPSK

99% Occupied Bandwidth Plot on Channel 23230



Date: 6 JAN 2015 13:58:21

26dB Bandwidth Plot on Channel 23230



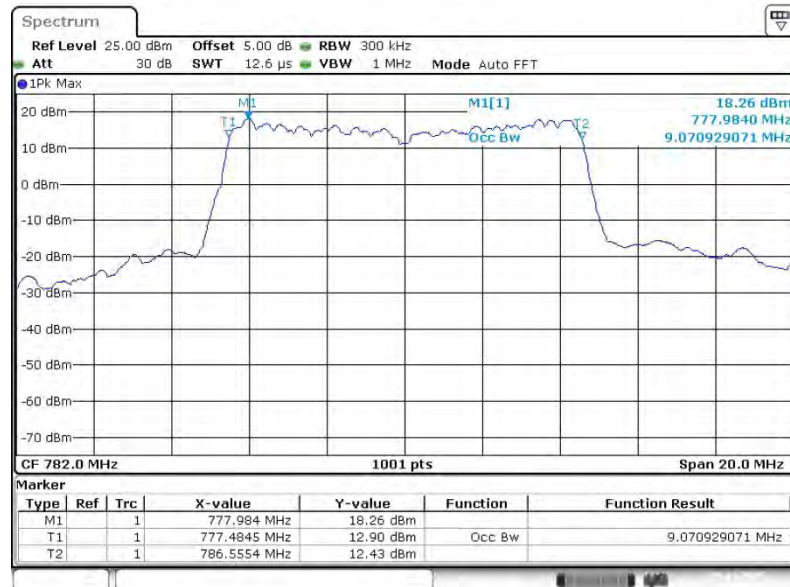
Date: 6 JAN 2015 13:58:43



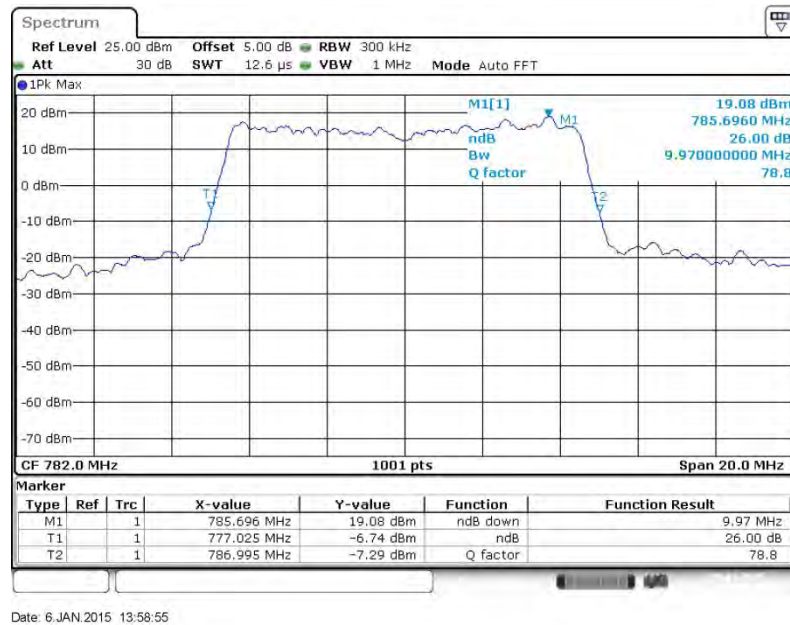
Band : LTE Band 13

BW / Mod. : 10MHz / 16QAM

99% Occupied Bandwidth Plot on Channel 23230

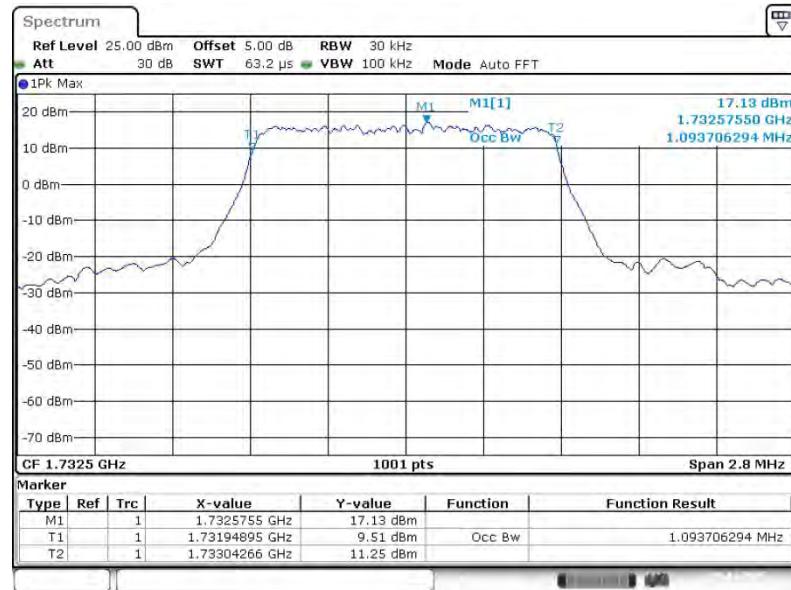


26dB Bandwidth Plot on Channel 23230

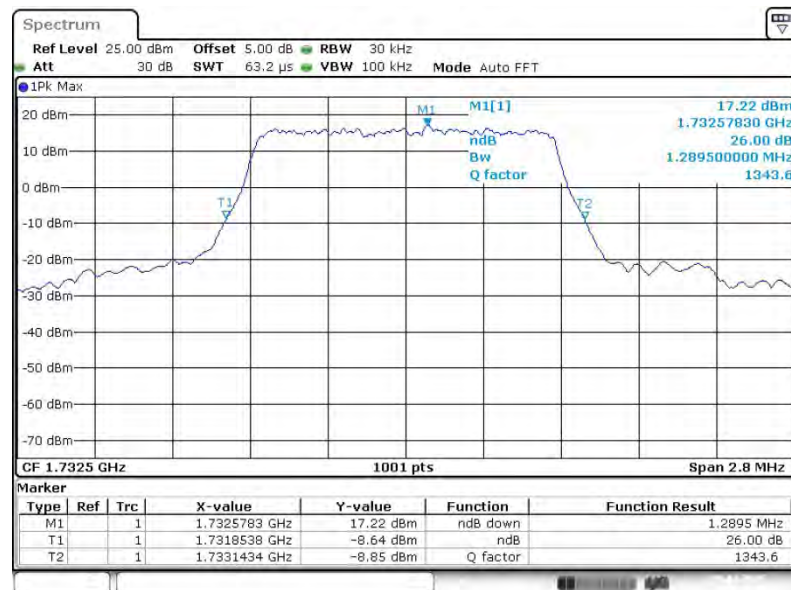




Band :	LTE Band 4	BW / Mod. :	1.4MHz / QPSK
---------------	------------	--------------------	---------------

99% Occupied Bandwidth Plot on Channel 20175

Date: 6 JAN 2015 10:21:56

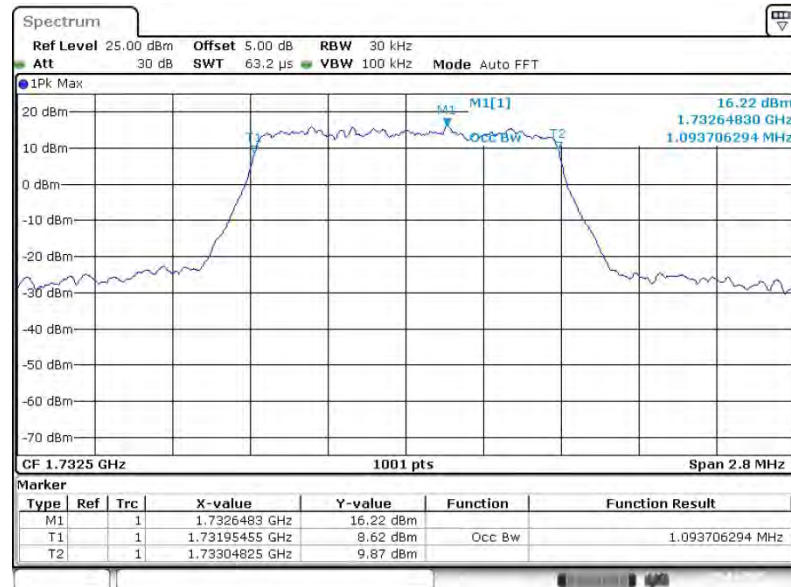
26dB Bandwidth Plot on Channel 20175

Date: 6 JAN 2015 10:22:17



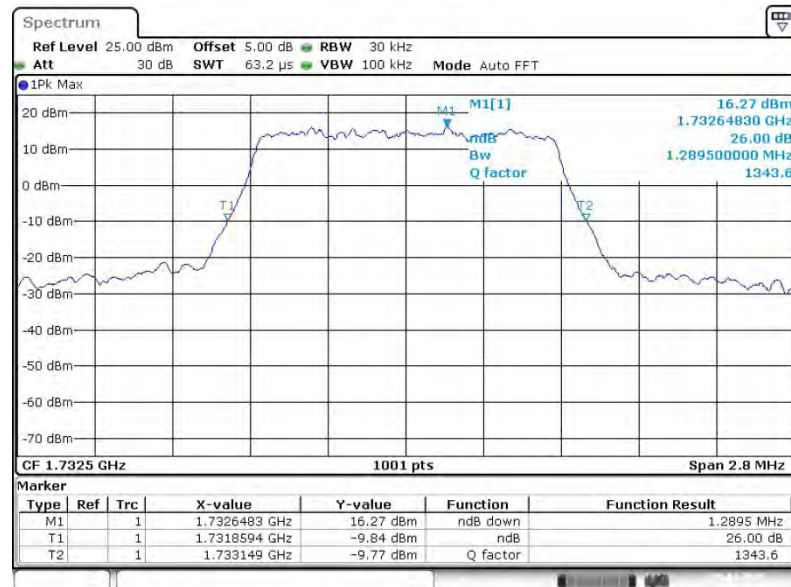
Band :	LTE Band 4	BW / Mod. :	1.4MHz / 16QAM
--------	------------	-------------	----------------

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 10:22:05

26dB Bandwidth Plot on Channel 20175

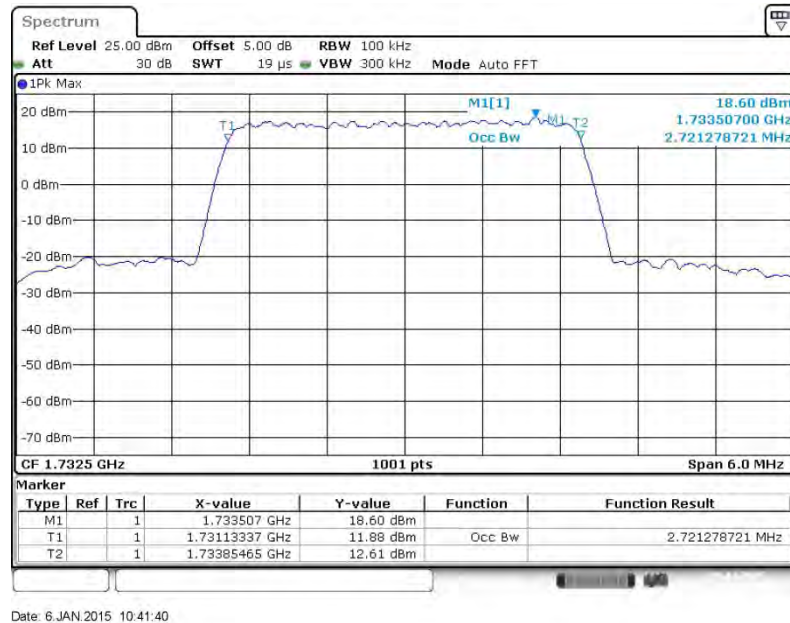


Date: 6 JAN 2015 10:22:29

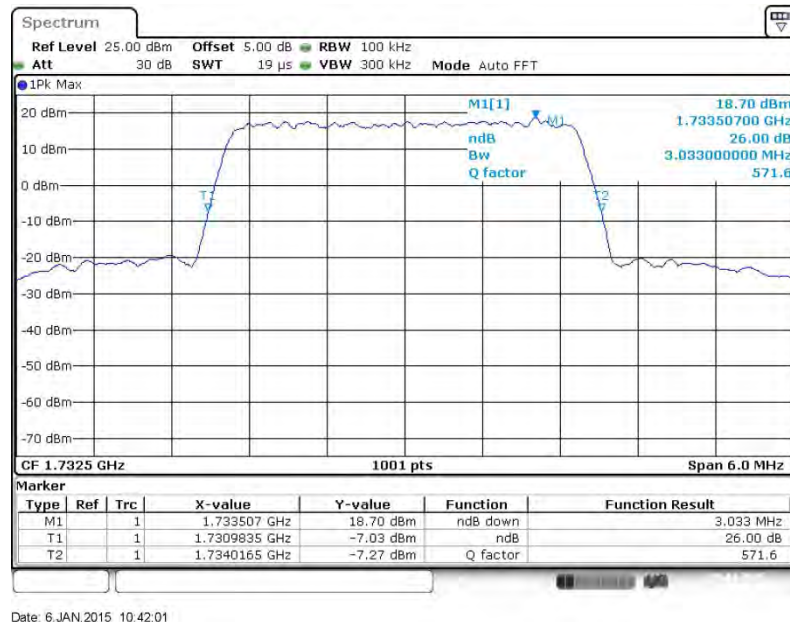


Band :	LTE Band 4	BW / Mod. :	3MHz / QPSK
--------	------------	-------------	-------------

99% Occupied Bandwidth Plot on Channel 20175



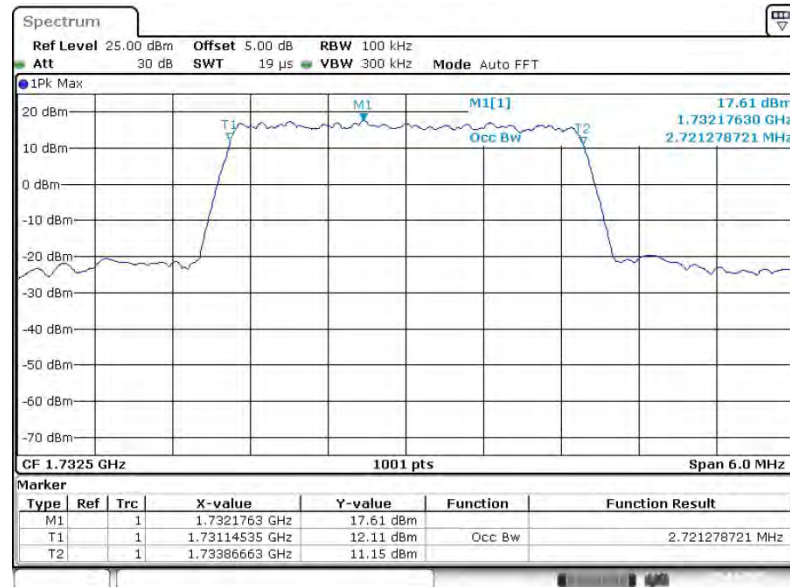
26dB Bandwidth Plot on Channel 20175





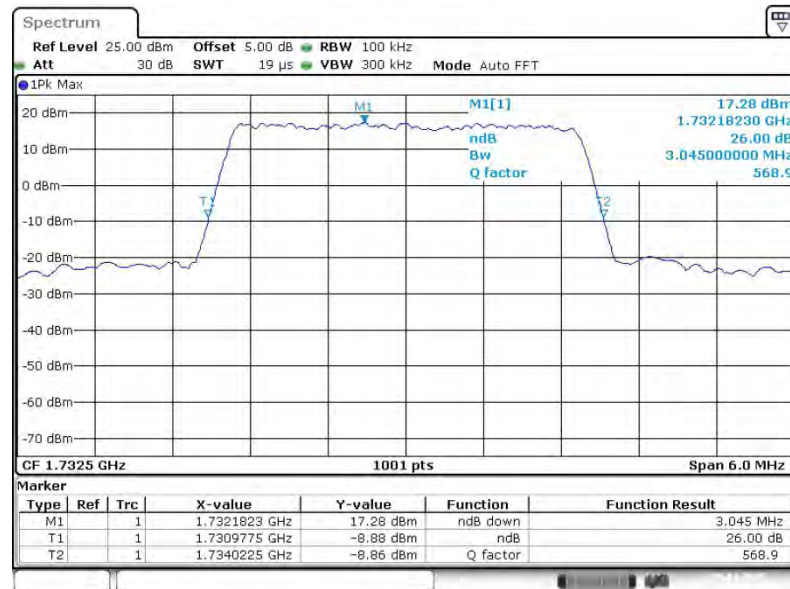
Band :	LTE Band 4	BW / Mod. :	3MHz / 16QAM
--------	------------	-------------	--------------

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 10:41:49

26dB Bandwidth Plot on Channel 20175

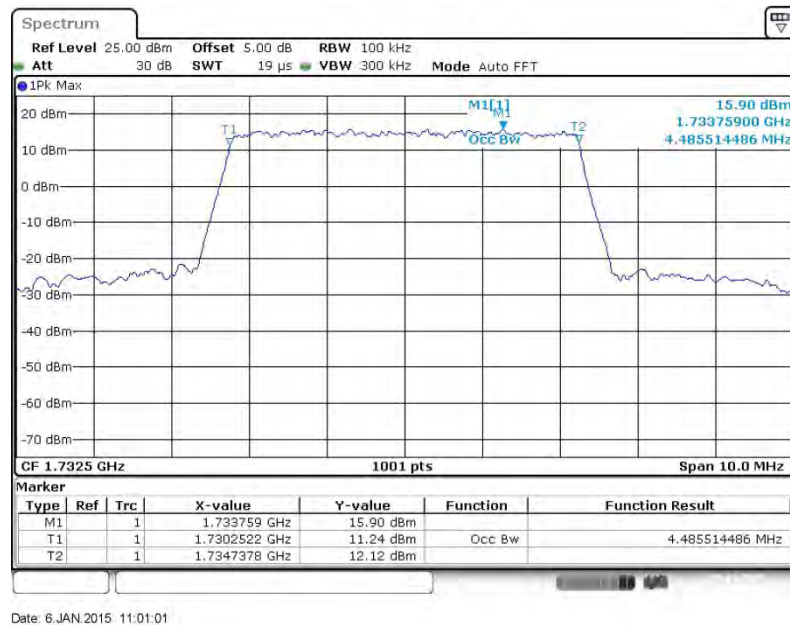


Date: 6 JAN 2015 10:42:13

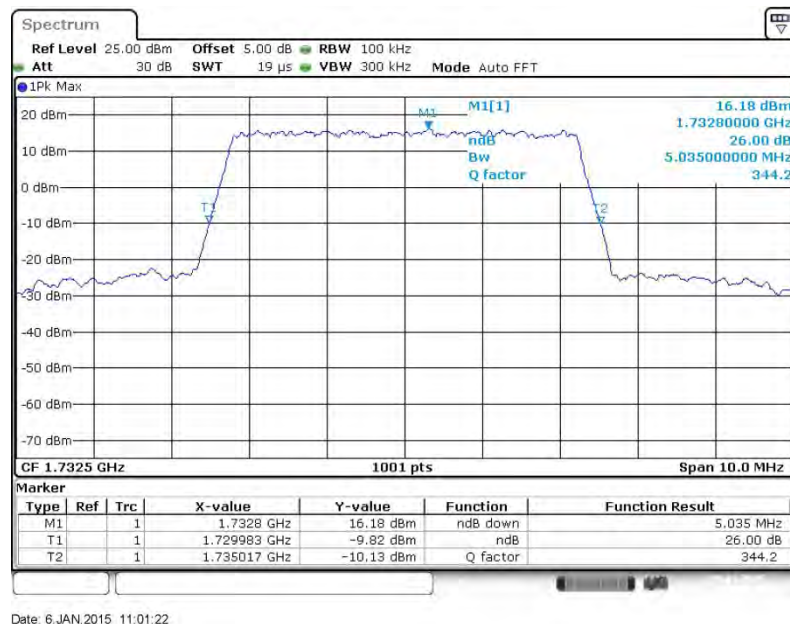


Band :	LTE Band 4	BW / Mod. :	5MHz / QPSK
--------	------------	-------------	-------------

99% Occupied Bandwidth Plot on Channel 20175



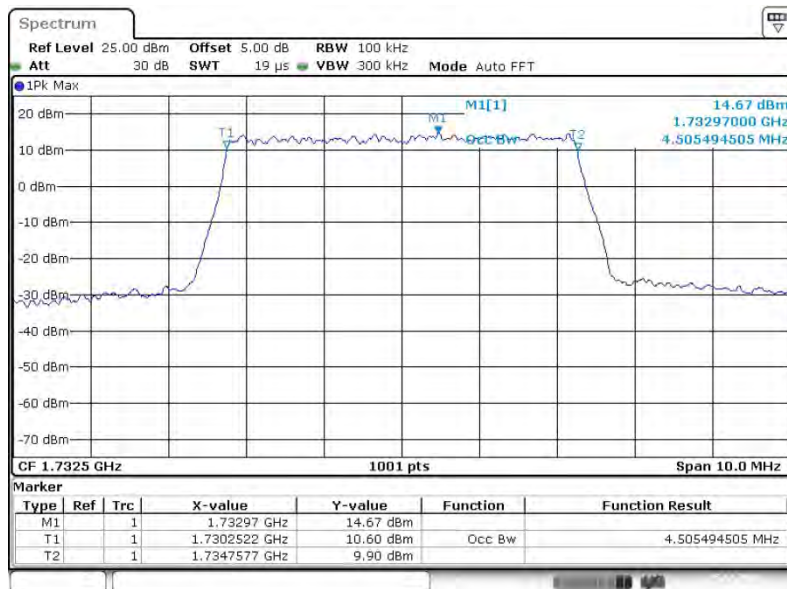
26dB Bandwidth Plot on Channel 20175





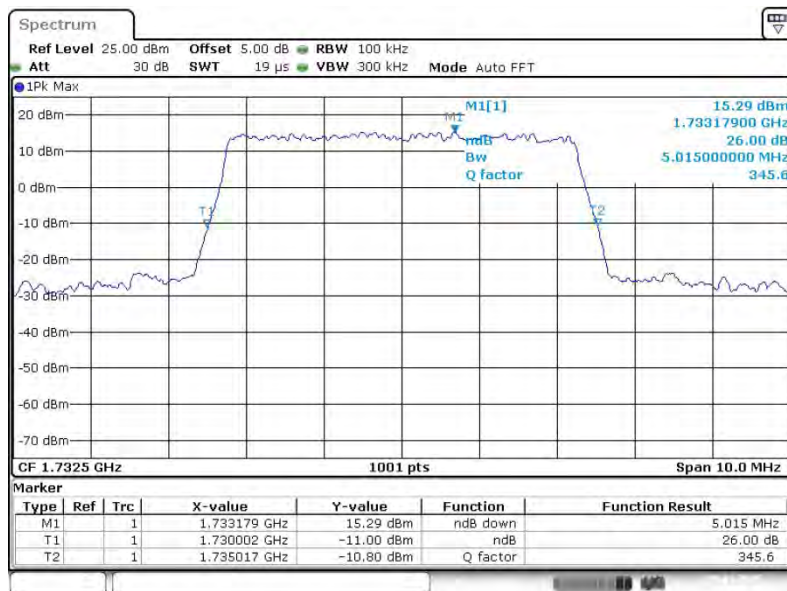
Band :	LTE Band 4	BW / Mod. :	5MHz / 16QAM
--------	------------	-------------	--------------

99% Occupied Bandwidth Plot on Channel 20175



Date: 25.DEC.2014 15:07:53

26dB Bandwidth Plot on Channel 20175

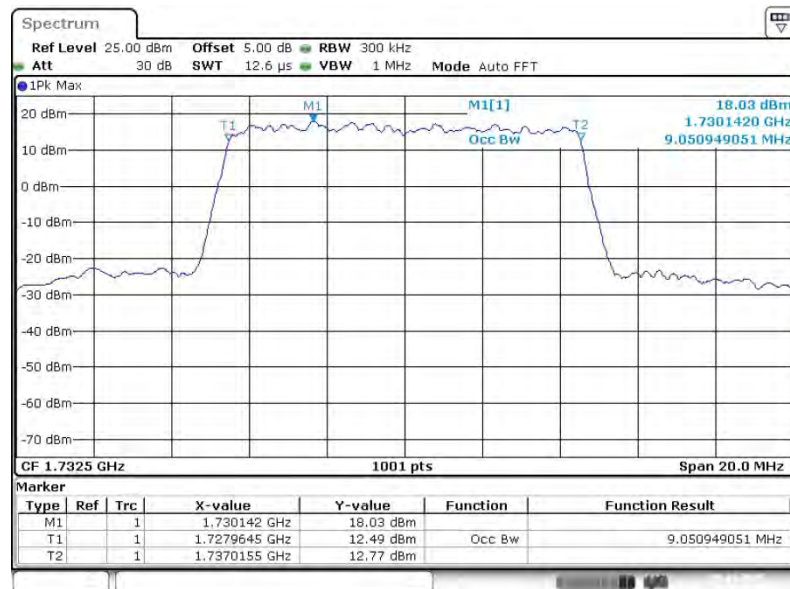


Date: 6.JAN.2015 11:01:34



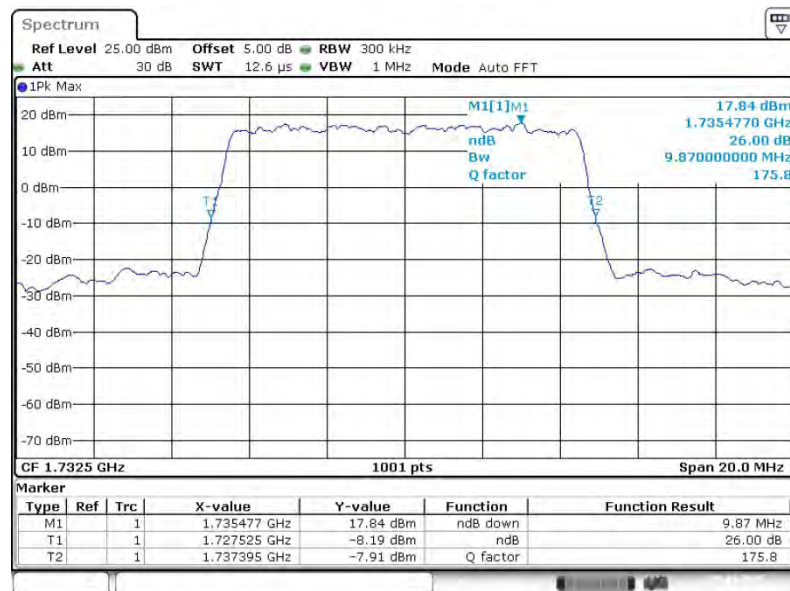
Band :	LTE Band 4	BW / Mod. :	10MHz / QPSK
--------	------------	-------------	--------------

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 11:20:28

26dB Bandwidth Plot on Channel 20175



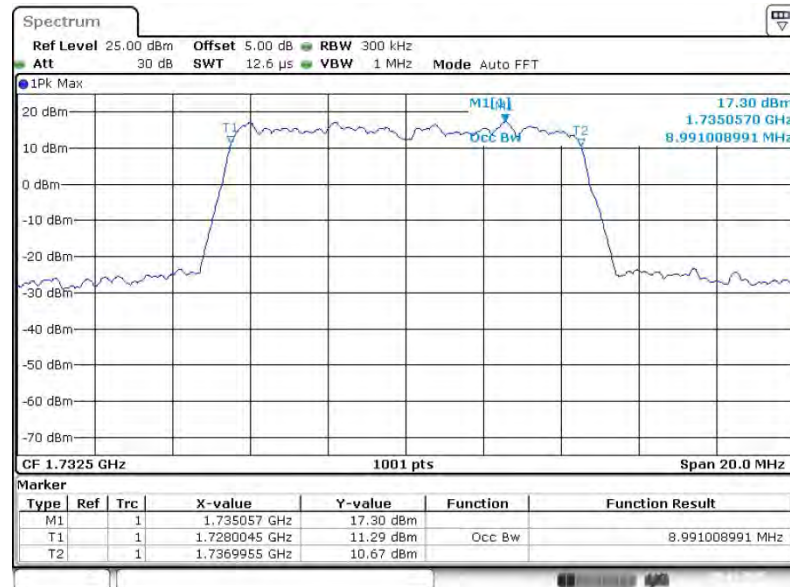
Date: 6 JAN 2015 11:20:50



Band : LTE Band 4

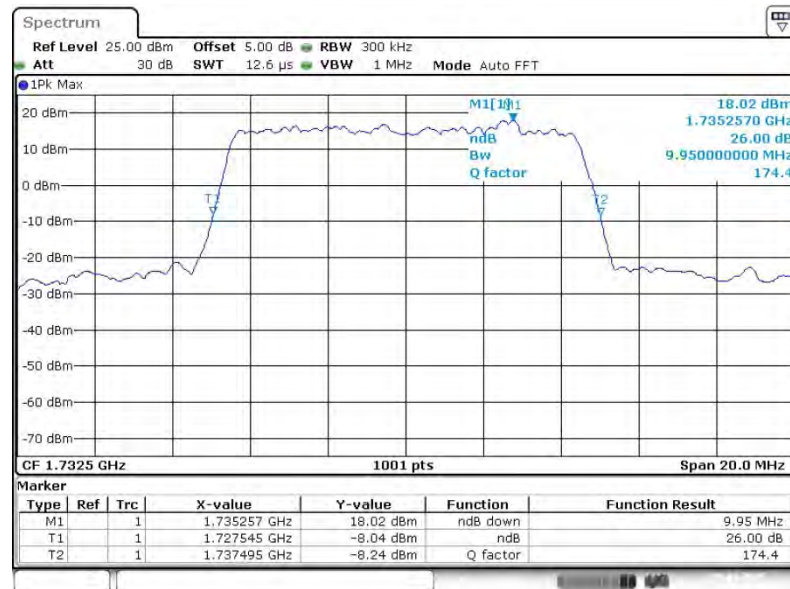
BW / Mod. : 10MHz / 16QAM

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 11:20:38

26dB Bandwidth Plot on Channel 20175



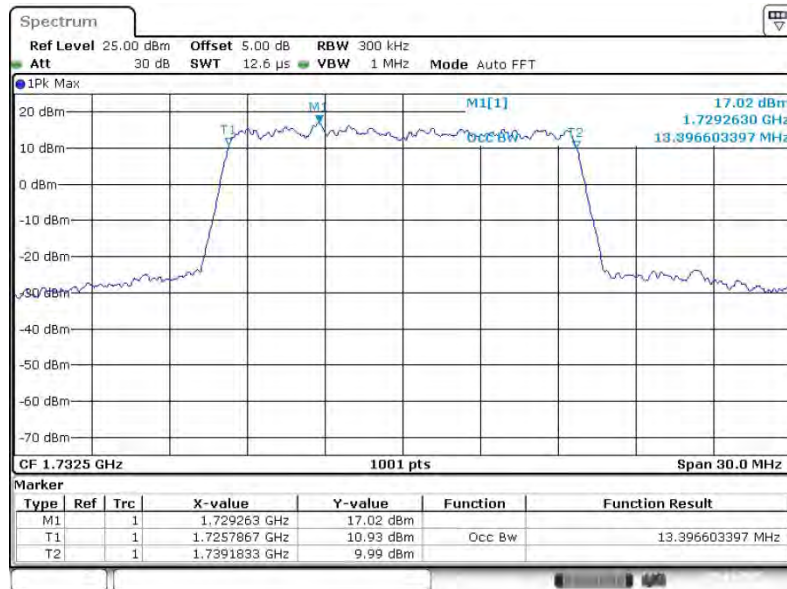
Date: 6 JAN 2015 11:21:02



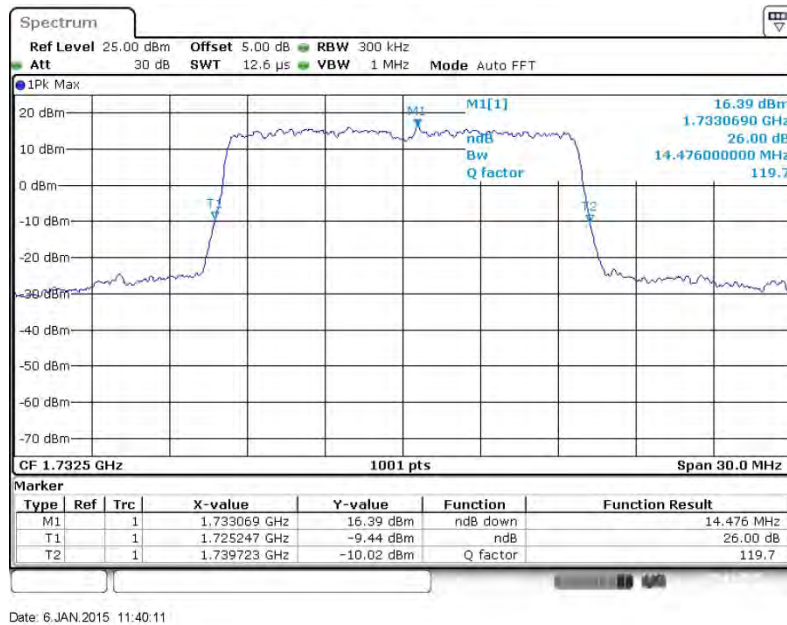
Band : LTE Band 4

BW / Mod. : 15MHz / QPSK

99% Occupied Bandwidth Plot on Channel 20175



26dB Bandwidth Plot on Channel 20175

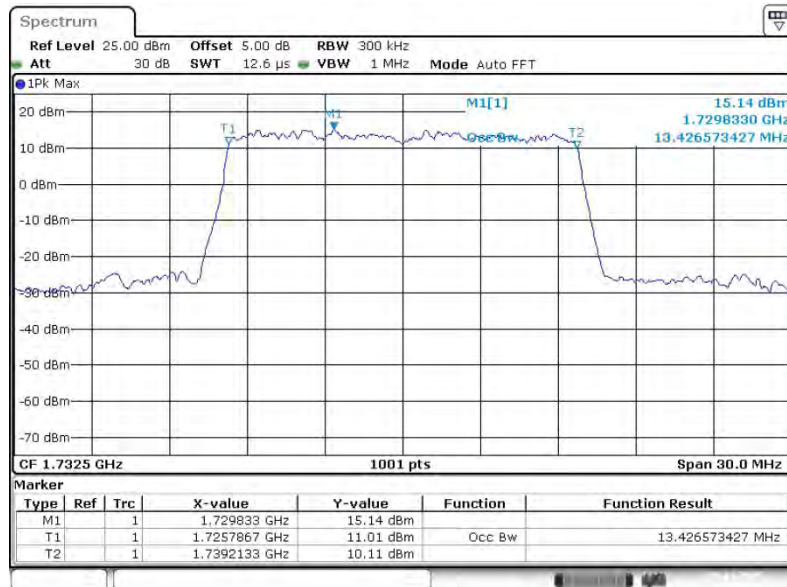




Band : LTE Band 4

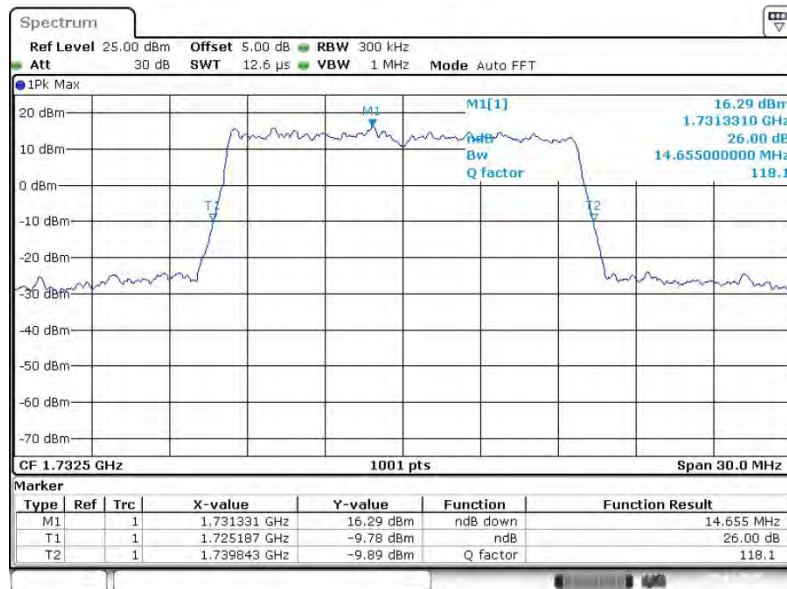
BW / Mod. : 15MHz / 16QAM

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 11:39:59

26dB Bandwidth Plot on Channel 20175



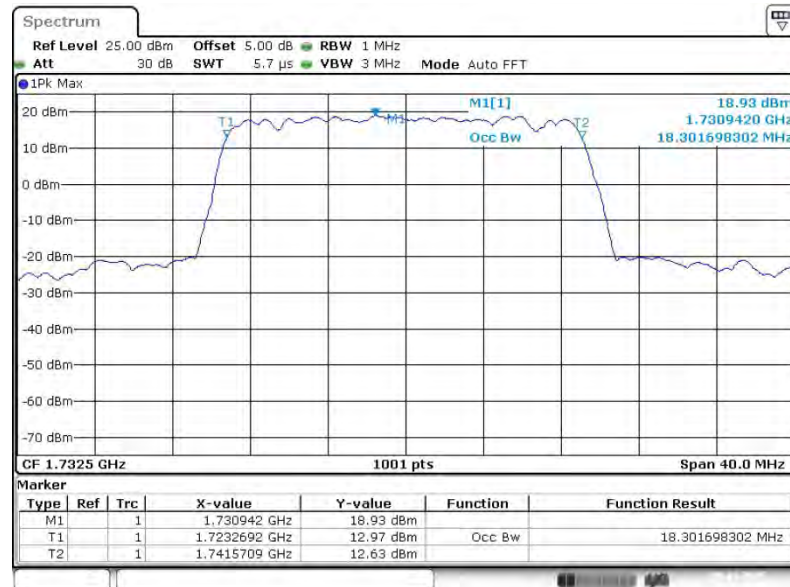
Date: 6 JAN 2015 11:40:23



Band : LTE Band 4

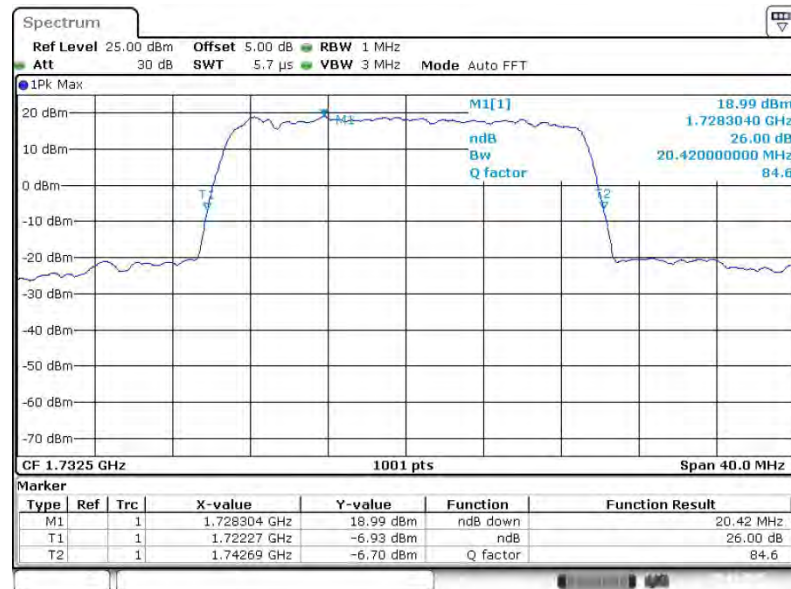
BW / Mod. : 20MHz / QPSK

99% Occupied Bandwidth Plot on Channel 20175



Date: 6 JAN 2015 11:59:10

26dB Bandwidth Plot on Channel 20175



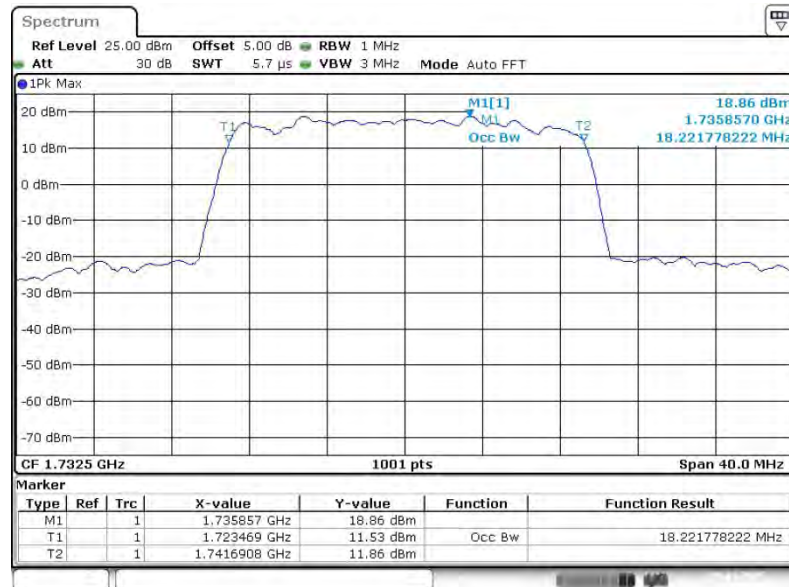
Date: 6 JAN 2015 11:59:32



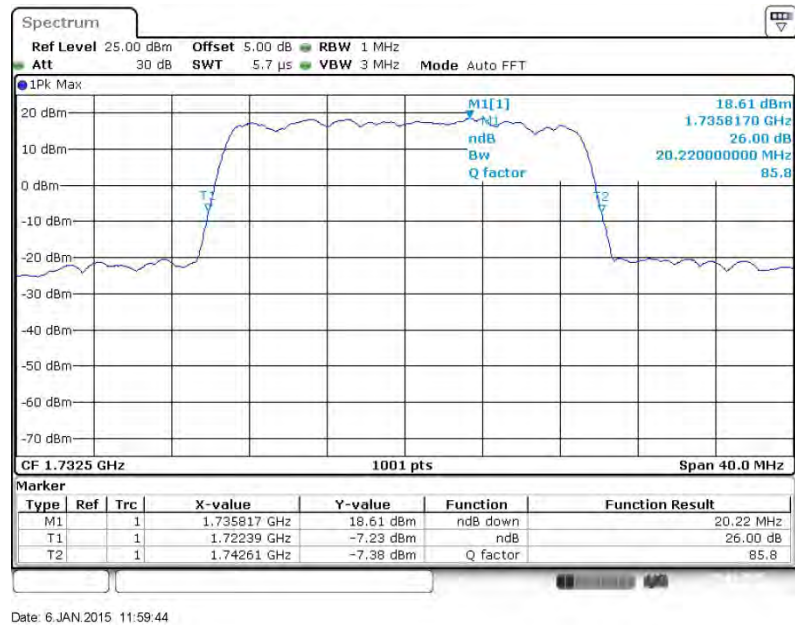
Band : LTE Band 4

BW / Mod. : 20MHz / 16QAM

99% Occupied Bandwidth Plot on Channel 20175



26dB Bandwidth Plot on Channel 20175



3.5 Conducted Band Edge Measurement

3.5.1 Description of Conducted Band Edge Measurement

27.53 (c)

For operations in the 776-788 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 100 kHz bandwidth. However, in the 100 kHz bands immediately outside and adjacent to the frequency block, a resolution bandwidth of at least 30 kHz may be employed. In addition, the power of any unwanted emissions in any 6.25 kHz bandwidth for all frequencies between 763-775 MHz and 793-806 MHz shall be attenuated below the transmitter power, P (dBW), by at least $65 + 10 \log_{10} p(\text{watts})$, dB, for mobile and portable equipment.

27.53 (h)

For operations in the 1710 – 1755 MHz band, the FCC limit is $43 + 10\log_{10}(P[\text{Watts}])$ dB below the transmitter power $P(\text{Watts})$ in a 1 MHz bandwidth. However, in the 1MHz bands immediately outside and adjacent to the licensee's frequency block, a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed.

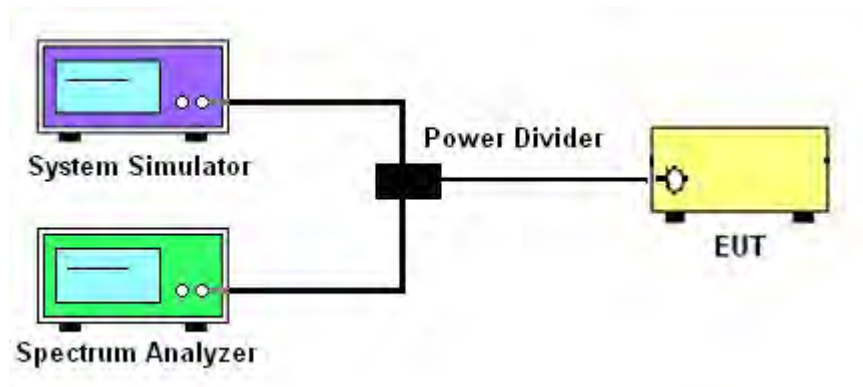
3.5.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.5.3 Test Procedures

1. The EUT was connected to spectrum analyzer and system simulator via a power divider.
2. The band edges of low and high channels for the highest RF powers were measured. Set RBW $\geq 1\%$ EBW in the 1MHz band immediately outside and adjacent to the band edge.
3. Set spectrum analyzer with RMS detector.
4. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
5. The limit line is derived from $43 + 10\log(P)\text{dB}$ below the transmitter power $P(\text{Watts})$
 $= P(\text{W}) - [43 + 10\log(P)] (\text{dB})$
 $= [30 + 10\log(P)] (\text{dBm}) - [43 + 10\log(P)] (\text{dB})$
 $= -13\text{dBm}.$

3.5.4 Test Setup

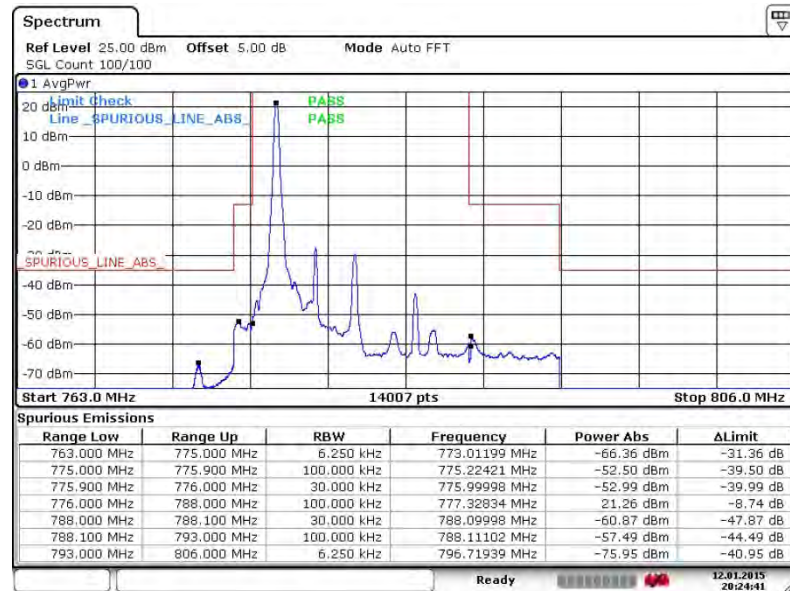




3.5.5 Test Result (Plots) of Conducted Band Edge

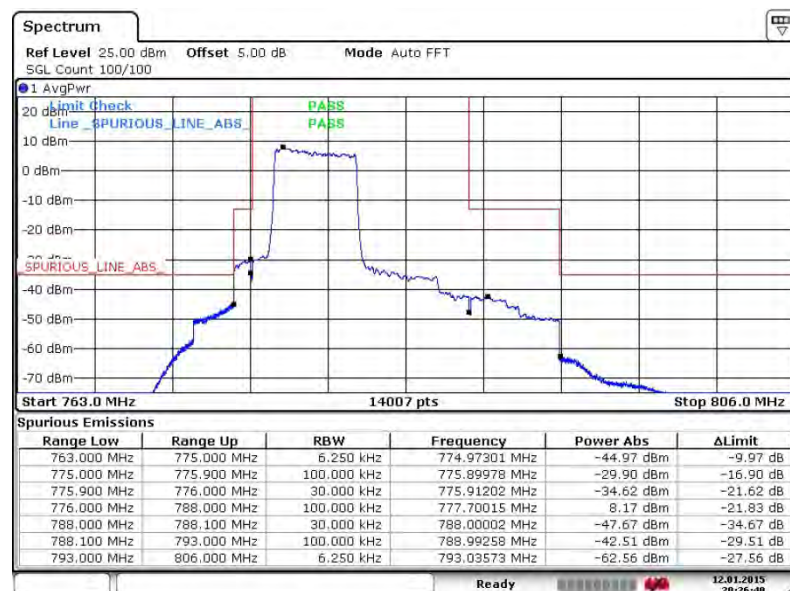
Band :	LTE Band 13	Band Width :	5MHz / QPSK
--------	-------------	--------------	-------------

Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0



Date: 12.JAN.2015 20:24:41

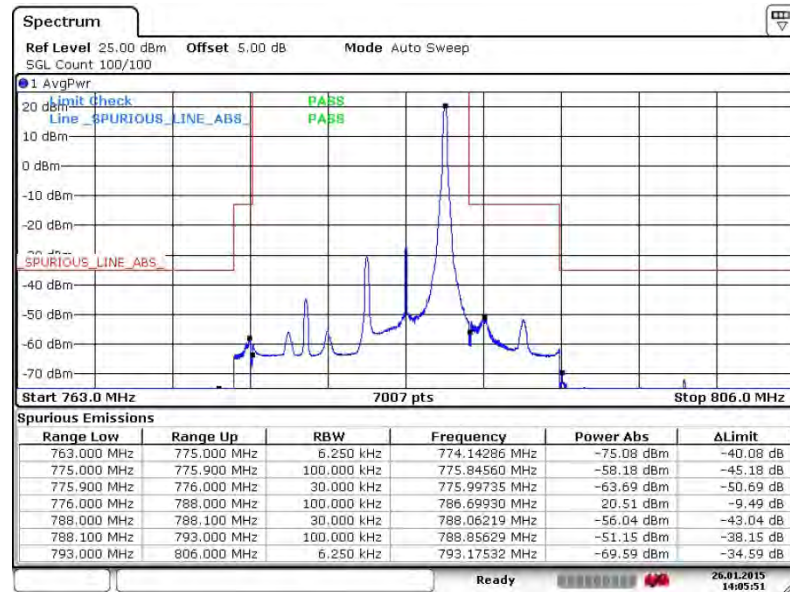
Lower Band Edge Plot for QPSK-RB Size 25, RB Offset 0



Date: 12.JAN.2015 20:26:40

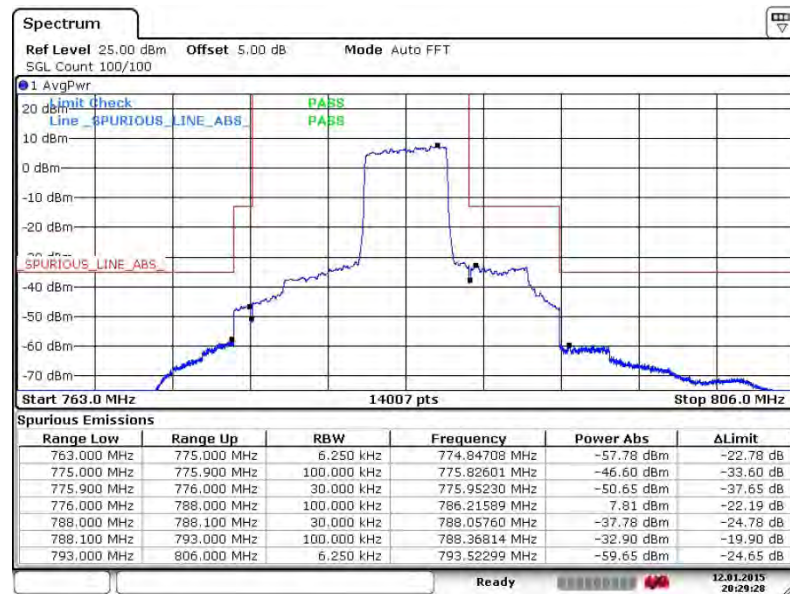


Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 24



Date: 26.JAN.2015 14:05:51

Higher Band Edge Plot for QPSK-RB Size 25, RB Offset 0

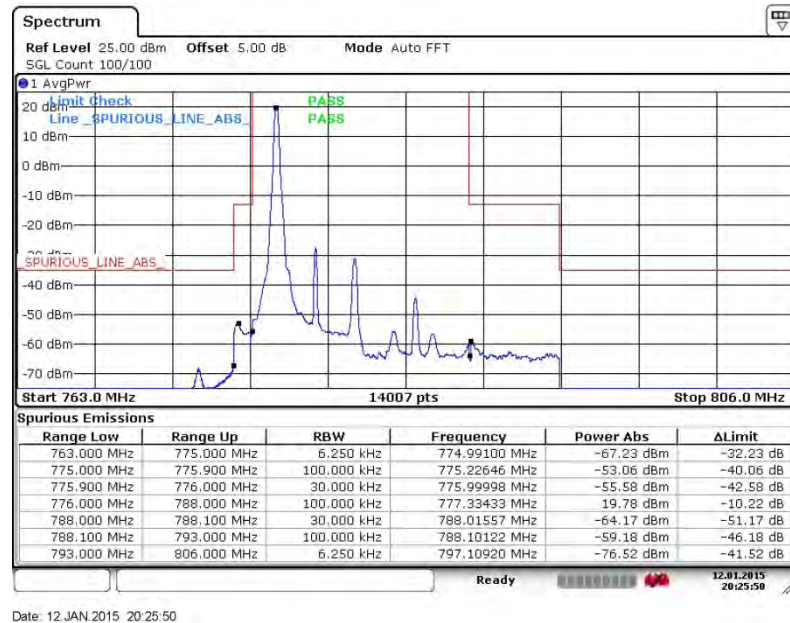


Date: 12.JAN.2015 20:29:28

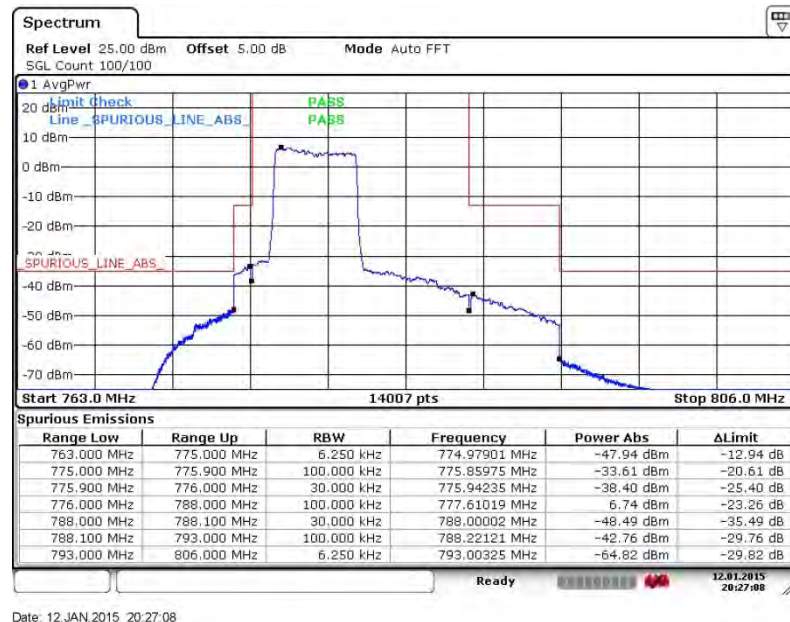


Band :	LTE Band 13	Band Width :	5MHz / 16QAM
--------	-------------	--------------	--------------

Lower Band Edge Plot for 16QAM -RB Size 1, RB Offset 0

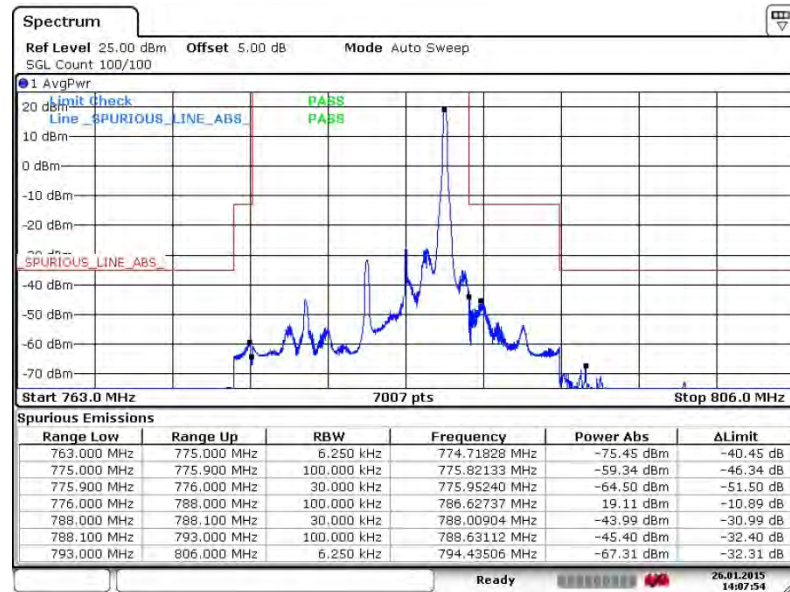


Lower Band Edge Plot for 16QAM -RB Size 25, RB Offset 0



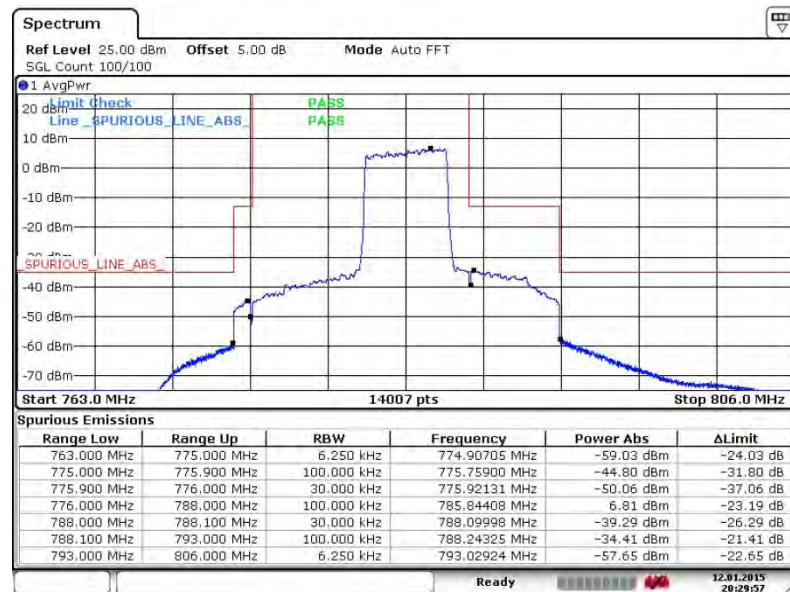


Higher Band Edge Plot for 16QAM -RB Size 1, RB Offset 24



Date: 26. JAN.2015 14:07:54

Higher Band Edge Plot for 16QAM -RB Size 25, RB Offset 0

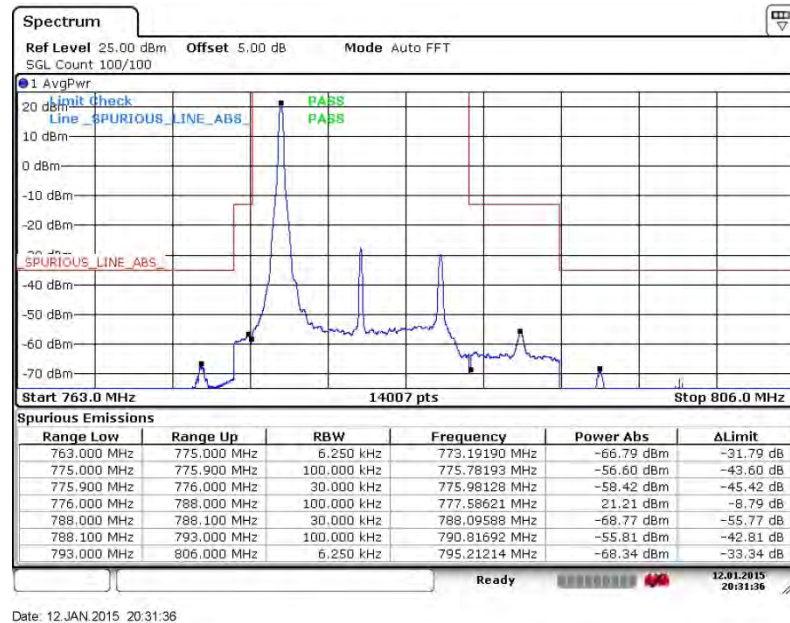


Date: 12. JAN.2015 20:29:57

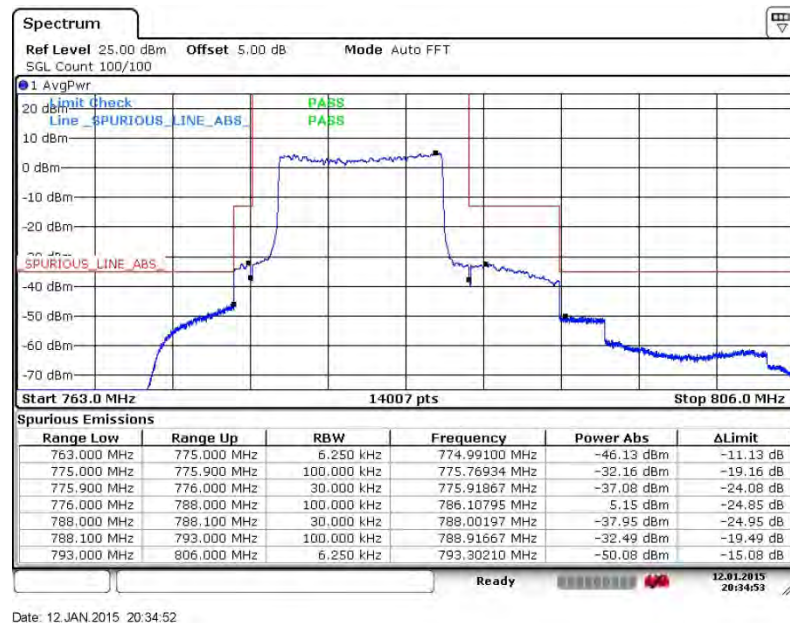


Band :	LTE Band 13	Band Width :	10MHz / QPSK
--------	-------------	--------------	--------------

Middle Band Edge Plot for QPSK-RB Size 1, RB Offset 0

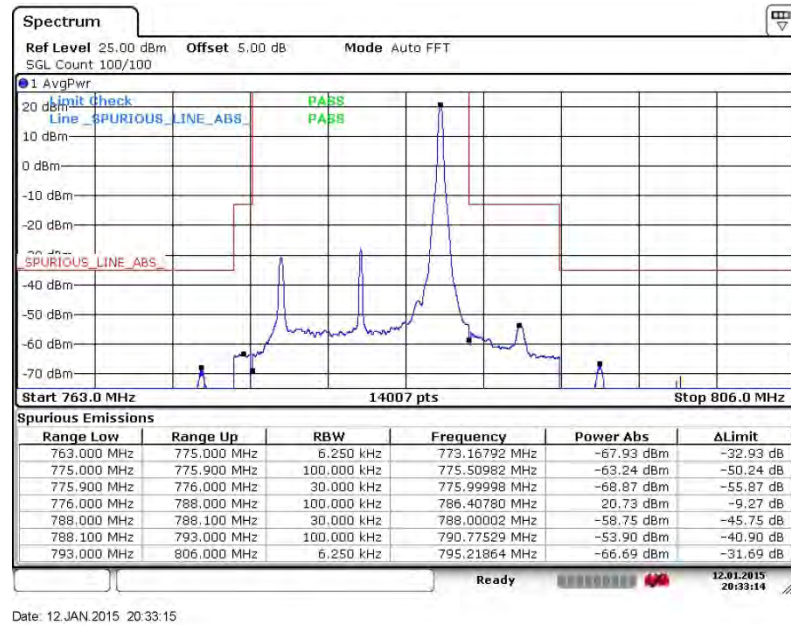


Middle Band Edge Plot for QPSK-RB Size 50, RB Offset 0





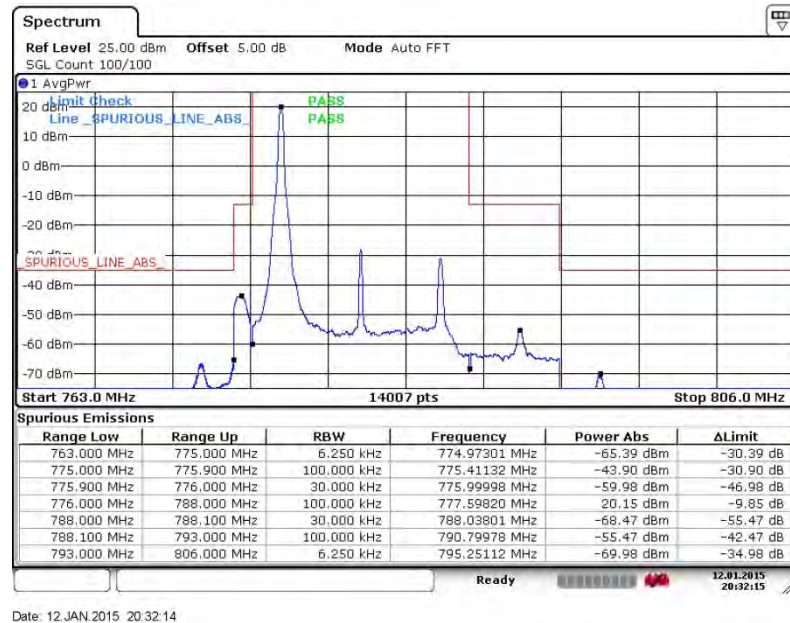
Middle Band Edge Plot for QPSK-RB Size 1, RB Offset 49



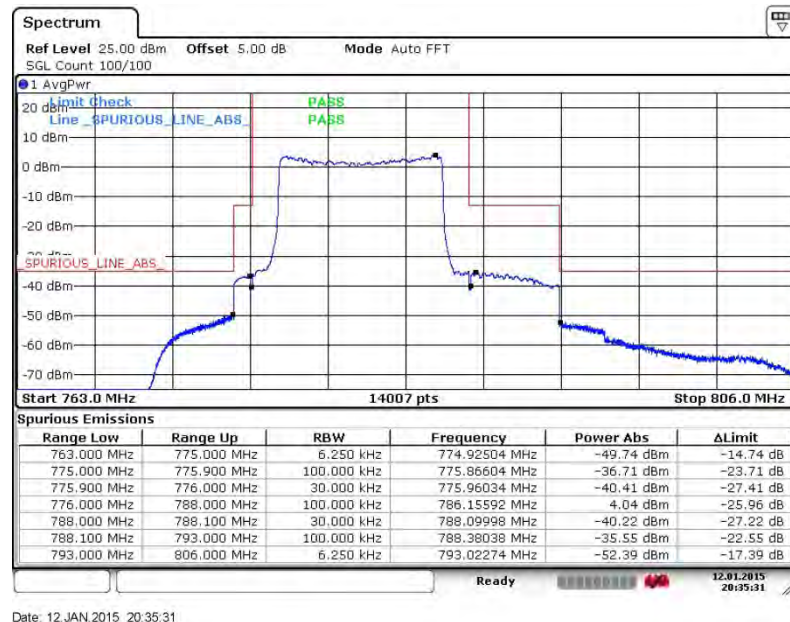


Band :	LTE Band 13	Band Width :	10MHz / 16QAM
--------	-------------	--------------	---------------

Middle Band Edge Plot for 16QAM -RB Size 1, RB Offset 0

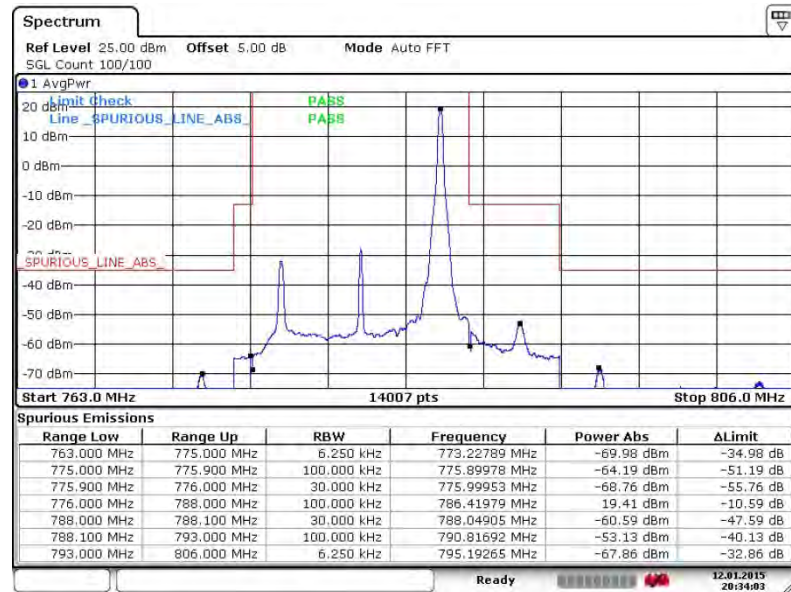


Middle Band Edge Plot for 16QAM -RB Size 50, RB Offset 0





Middle Band Edge Plot for 16QAM -RB Size 1, RB Offset 49

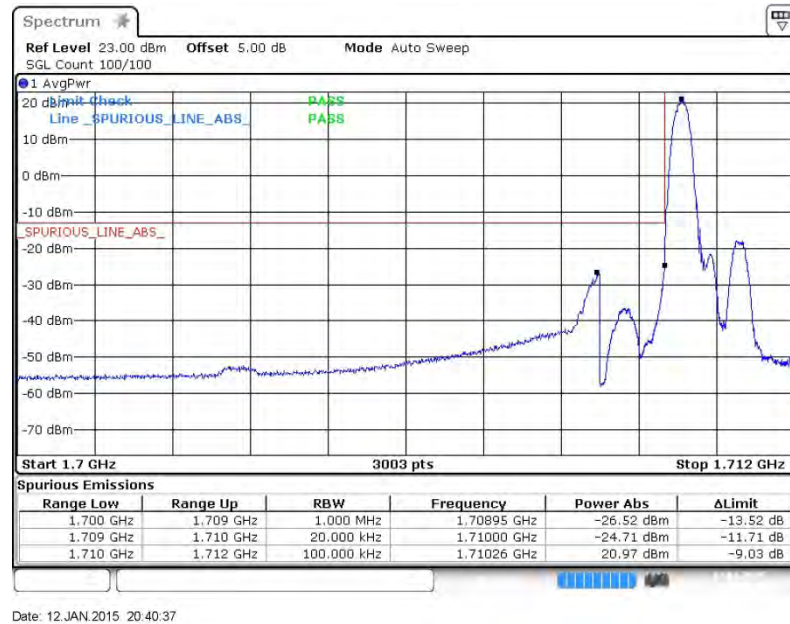


Date: 12.JAN.2015 20:34:03

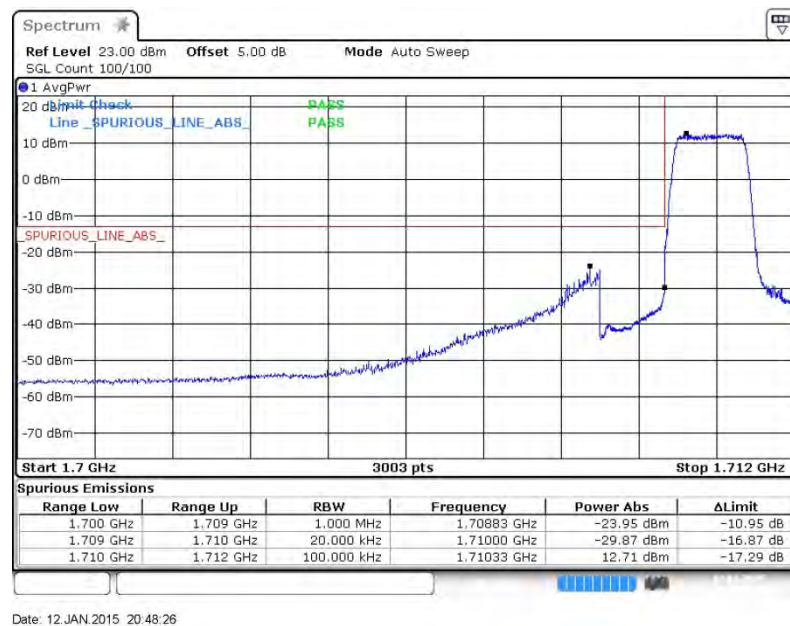


Band :	LTE Band 4	Band Width :	1.4MHz / QPSK
--------	------------	--------------	---------------

Lower Band Edge Plot for QPSK-RB Size 1, RB Offset 0

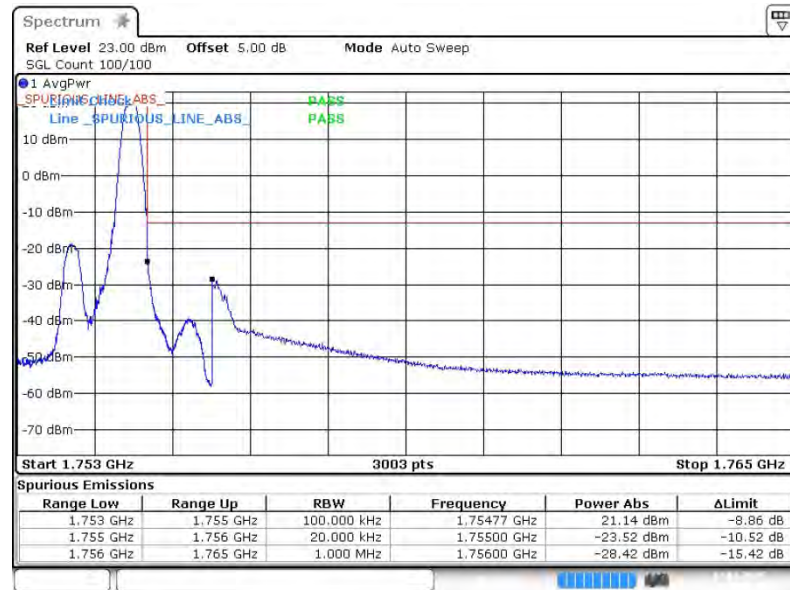


Lower Band Edge Plot for QPSK-RB Size 6, RB Offset 0





Higher Band Edge Plot for QPSK-RB Size 1, RB Offset 5



Higher Band Edge Plot for QPSK-RB Size 6, RB Offset 0

